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CANNING CENTERS

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WAR FOOD ADMINISTRATION

UNITED STATES DEPARTMENT OF AGRICULTURE

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PREFACE

Community canning centers have been operating successfully for a number of years in some sections of the country. In others they are a recent development. In all sections, however, interest in such centers has been stimulated by the wartime need of preserving fruits and vegetables in order that civilian food requirements may be met and in order that foods will not go to waste during periods of peak production.

As a result of this development there have been many requests for information on the establishment and operation of community canning centers. This publication has been prepared to meet these requests. It is based on the experience of successfully operated community food preservation centers and represents the present thinking of a group of plant supervisors and authorities in the field of food preservation.

Although the scope of this publication has been limited to canning, many communities that plan long-term programs may find it desirable to include other methods of preservation, such as quick-freezing, dehydrating, salting, brining, and storage. Such additions to the canning unit can be made readily because the equipment used in the preparation of foods for preservation is basic to all methods.

The canning techniques presented are for approved steam-pressure and water-bath methods and are based on uniform, ungraded products, packed in a clean, sanitary manner. Of necessity, this publication is written from the national point of view to apply to all sections. The techniques need to be adapted for local use, and to conform with State food, safety, health, and sanitation laws.

This publication supersedes Miscellaneous Publication No. 472, Community Food Preservation Centers.

Washington, D. C.   Issued April 1944

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Community Canning Centers

Prepared by the Office of Distribution
WAR FOOD ADMINISTRATION

GETTING THE COMMUNITY ORGANIZED

Community canning centers will not just happen. They must be planned and arranged for well in advance of the season for their need. Planning soundly and getting the center operating on a business basis from the beginning is necessary if the center is to be successful over a period that justifies the expenditure of money and effort involved.

Successful canning centers usually are the result of group action spurred on by some individual who sees the need for preserving all food supplies and has the energy to do something about it. It doesn't matter who this is -- an energetic homemaker, a home demonstration agent, a businessman growing his first garden, a teacher of vocational agriculture or home economics, or a civic leader.

Such a leader will round up a group of interested persons to determine the need, the interest, the territory to be served by the prospective center, whether all families or only a limited number in the territory are to be included among patrons of the center, and what canning equipment is already on hand in the community. Many communities include school-lunch and institutional needs in the initial survey.

A satisfactory method of getting much of the information needed in the survey is to send circulars or questionnaires to families in the community. Such questionnaires will determine whether or not a family is interested, the kind and amount of food they would like to put up, and whether this food will be home-produced or bought. A more accurate survey can be had if food budgets recommended by State departments of agriculture are used as guides for setting up information to accompany the questionnaire.

Where the initial survey reflects a real need and interest in establishing a canning center, the most effective way of getting the matter in the hands of community members is to have a public meeting. At this meeting a working committee should be elected and given the authority to get the program organized and operating. This committee will then need to report only occasionally to the persons participating.

On the personnel of this committee will depend the effectiveness of the program. Its membership should include representative citizens who can head subcommittees to handle specific problems involved, thus building up an effective organization. It is well to include on the committee a businessman, a home economist, a teacher of vocational agriculture, an engineer, a newspaper publisher, a health officer or physician, members of civic and service clubs, school boards, and local government. Subcommittees may need to be organized to give direction and supervision on (1) financing, (2) housing and equipment, (3) public relations and arbitration, (4) operation, and (5) health and sanitation of the plant. By dividing the direction of the program in this way, the responsibility is left to the group rather than to an individual.

Until the plant has been established and is ready to operate, the working committee will be busy making such decisions as the following: (1) How to finance the cost of the center; (2) selection of a supervisor or manager; (3) size and type of preserving units to be installed; (4) selection of site and building; (5) development of floor plans for installation of equipment; (6) purchase and installation of equipment and supplies.

With the supervisor, the committee will determine what the policies of the plant will be on agreements to be made with patrons, the type of training that patrons will be given, the number of persons required to operate the plant, and the type of publicity needed to inform the public of the plant's progress. As the season gets under way, the supervisor will need the assistance of the committee to solve operating problems and to make improvements or changes in the center from time to time.

PLAN FOR FINANCING

A community cannery must have initial funds for equipment and supplies, housing and utilities, necessary labor and supervision, and for protective insurance for workers. Such funds may be obtained through popular subscription or a bond issue in the community. Often, however, the local board of commissioners, welfare board, school board, farmers' cooperatives, chamber of commerce, or civic and fraternal organizations assume these initial costs. Many communities have found it advisable to incorporate the canning center on a nonprofit basis.

Other sources of support for the community cannery are contributions by civic-minded individuals or groups. In some States, legislators have appropriated funds to assist in establishing and operating food-preservation centers. Committees should investigate all possibilities for financial assistance. They will find helpful information on available Government aid from the State agricultural extension service or the State department for vocational education.

To pay the overhead costs of the center, the usual method is to collect a small service charge for each can of food processed. This cost is based on the price of the can plus a small charge for services and utilities. If the plant is operated at capacity, a fund may accrue from this source to pay off indebtedness as well as to cover costs of replacements and repairs.

When the community wishes to operate the center to supply food for organized groups, institutions, or school-lunch programs in addition to regular community canning, a toll in canned products may be collected. The amount of toll will vary with the local cost of operation.

If the committee maintains central control of purchases for the seasonal supply of cans and fuel, a real saving in overhead costs can be realized. Containers may be purchased in cooperation with other communities if the quantities required do not make up a carload lot. (See Purchase of Cans on page 35.)

SELECTING A SUPERVISOR

Every canning center should have, if possible, a paid supervisor who is on the job all the time that the center is in operation. In large canning centers such a supervisor is essential.

The supervisor will have the responsibility of seeing that patrons, employees, and volunteer workers are well trained in proper methods of preparing and processing foods and in operating the equipment. She will be responsible for making appointments, scheduling produce, scheduling and supervising employees, determining and ordering supplies needed, and maintaining the necessary records for efficient operation. She will also assume the responsibility for the care, replacement, and repair of equipment.

From time to time, she may present to the committee plans for improved operation, such as rearrangement of equipment for a better flow of work, or for additional equipment required to improve or expand operation.

Qualified supervisors are likely to be found among home demonstration agents, teachers of home economics or vocational agriculture, commercial canners, and canners trained in the former WPA program. If possible, it is well for the supervisor to have had actual experience in operating a canning center. In addition to being able to direct and train others, the supervisor should possess good judgment and ability to meet emergencies.

State training programs conducted by groups or agencies directing or assisting community food preservation programs should be attended by the supervisor selected. Other training experiences, such as visiting a commercial cannery, may prove helpful in planning and scheduling work and evaluating the plant in terms of improved efficiency.

Where a State agency provides the services of a State-wide technical supervisor and a bacteriologist, communities should request their assistance as necessary.

DECIDING THE SIZE AND TYPE OF CANNERY

The size of the cannery will be determined by the quantity of produce that will be necessary to be canned daily to meet the total anticipated production requirements for the canning season.

The canning season will vary with the length of the harvesting season and the kind of products to be canned.

To estimate roughly the daily capacity of the unit and consequently the amount of equipment needed, divide the total number of cans to be produced by the approximate number of days the cannery will operate. Then add from 10 to 15 percent to allow for the peak production period when the greatest variety and amount of food can be expected. Whenever possible, a year-round plan of operation is advisable and should be encouraged.

The small center using pressure cookers and small retorts heated by gas is satisfactory for a daily production up to 800 cans and not to exceed 1,000 cans of produce. The steam-operated plant using small and medium-size retorts should be established where the expected daily production is greater than 1,000 cans. Where the daily output will exceed 6,000 cans, it may be advisable to establish more than one plant, especially if the area is one which involves transportation difficulties.

Living conditions of the population also must be considered. Pressure-cooker units are recommended where the population is more or less transient and in areas where homes are widely scattered. Steam-operated plants are established only when an adequate supply of produce can be assured to keep the plant in operation and preferably in a locality where families are permanently established. A tie-up with the needs of a school-lunch program or with some local institution is desirable in affording permanency to the program. Steam-operated plants established near farmers' markets provide an excellent means of caring for produce that might otherwise be wasted.

SETTING UP THE PLANT

SELECTING THE SITE AND BUILDING

The site for a community cannery should be considered first of all in the light of a central location for the area to be served. Factors such as the accessibility to trucks and vehicles bringing produce to the plant, amount of traffic, available parking areas, and existing regulations concerning the establishment of such a plant in that area, should be kept in mind. If there is an indication of large production, the location of the plant near railroad shipping facilities should be considered. Other factors governing selection of site would be the water supply and existing utilities.

Running water is a minimum requirement because of the varied needs for safe and efficient operation. The water supply line should be of adequate size to deliver an ample supply for all processing and sanitation needs. In the absence of a previously approved water supply, the water should always be tested for mineral content, purity, and degree of hardness.

Electric service should be heavy enough to support the load required and should be of the voltage necessary to operate the motor-driven equipment.

Gas service for gas-operated units should be adequate for operating all units in the plant at the same time.

A telephone should be provided to facilitate scheduling. In large plants an extension may be necessary.

The building most practical for canning uses is one in which the cannery can be located on the ground floor. In a two-story building the second story may well provide sufficient space for empty-can storage. Small pressure-cooker units may be located in schools, church basements, or similar places that provide needed space and utilities. However, it is desirable to obtain a separate building for a steam unit.

When selecting a building, consider first commercial canning plants where equipment has already been installed. Consider also abandoned bottling works, bakeries, laundries, garages, creameries, and other buildings where steam facilities have already been installed. Buildings adjacent to steam facilities may be used also. Check such facilities to be sure they are of ample capacity to supply both plants.

The size of the building will be determined by the amount of produce to be preserved, the type of equipment to be used, and the number of patrons that probably will be working at one time. A rectangular building is most desirable because its floor space can be used to best advantage when arranging equipment. However, any space having the required number of square feet could be used. Floor space required for the preparation and processing area and for boiler rooms for various-sized plants can be determined from the floor plans shown at the back of this publication. (See figures 19-23.)

In larger units, separate office space may be desirable. In addition, there should be dressing rooms and toilet and lavatory facilities properly segregated from the canning area. Container storage space and warehousing needs will vary with the size of the plant.

The building needs to be well lighted and properly ventilated. Sufficient windows should be provided so that artificial lighting will not be necessary during the daylight hours. However, artificial lighting will be required at times and should be planned for and so arranged that each operation is well lighted. Lights should be suspended above head level and so shaded as to prevent glare on the workers' eyes.

Windows arranged to take advantage of the prevailing winds provide good cross ventilation. In one-story buildings the ventilation and lighting may be improved by the use of roof ventilators and skylights. It may be necessary to supplement natural ventilation with exhaust and circulating fans.

Consider also facilities for heating the building during the winter season, should the plant be in use at that time. Be sure the ceiling is high enough to assure a comfortable room temperature. A minimum ceiling height of 10 feet is required to allow for clearances necessary where a track and a hoist are used over retorts. The floor load capacity of the building should be determined and not in any case exceeded.

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Floors constructed of rough-finished concrete, free from cracks and crevasses, and well drained at or near the points where quantities of water are used, are preferable. In the construction of a new building for a cannery the drain location should be predetermined in relationship to the installation of the equipment. For proper floor drainage the pitch from the wall to the drain should be 3/4 to 1 inch for every 10 lineal feet. Where old floors are not equipped with suitable floor drains, improvised drains may be made in the form of box gutters installed in the floor. In floor areas where drainage is insufficient the use of slatted platforms will keep the operators' feet dry.

It should be determined whether there is an existing sewage disposal system, and if one is not available a septic tank should be installed.

The walls should be in good repair and have a surface that can be easily kept clean.

The building should have at least two doors, one located at the most convenient point for delivering produce to the plant, the second door to be used in checking out canned goods. It is preferable that doors open outward and that all openings of the building be well screened.

MAKING THE FLOOR PLANS

Floor plans are included in this publication to suggest equipment placement that will insure a good flow of work through the plant. These plans set forth placement details that are known to be satisfactory, and although there may be several other methods that are just as successful, no great deviation should be made from the principles involved.

Table 1 lists canning equipment for community canning plants of various sizes as shown in floor plans included in this publication. This listing should help a community in determining equipment for any size plant it may wish to establish. The estimated capacity of all units is based on the use of tin containers.

For plant efficiency and smooth operation it is necessary to assign each piece of equipment to its proper place and to the space required for its successful operation, keeping in mind its relation to sequence of operation.

A successful sequence of operation is one that permits a steady, progressive flow of produce from the receiving area through the various necessary steps of washing, preparation, filling, exhausting, sealing, and finally of processing, cooling, and warehousing. Since the sequence of operation varies somewhat with different products, the floor plan should be checked to determine whether it is sufficiently flexible to accommodate all types and quantities of products to be processed.

The receiving area may be inside the plant or outside on a screened platform. The area will vary in size according to the anticipated daily deliveries of produce. For convenience in checking in produce the area should be provided with a small desk or table for the receiving clerk. A portable table of convenient height for writing while standing may be used for this purpose and moved to the exit to complete records as patrons are checked out. It is often convenient to have the receiving area large enough to include a table for rough preparation of produce, such as husking corn or topping vegetables, and also for rough washing of greens or the soaking of root crops.

Where the rate of receiving is faster than the rate of progress of the produce through the plant it may be necessary to provide for temporary storage in the receiving area. The space should, if possible, be large enough to avoid the necessity of stacking hampers on top of each other. If stacking is necessary, use slatted dividers between the hampers. The space assigned for the temporary storage should be as close as possible to the line of production and should not interfere with traffic or plant operations.

Equipment should be of a size or capacity to permit rapid handling of produce in all steps of preparation. Work areas should be planned in relation to equipment to allow sufficient space for each operation without either crowding patrons or unnecessarily losing time and motion. In placing equipment each step in preparation of the products to be processed should be considered.

The space needed for preparation of the products is determined by the number of patrons who will be using the cannery at one time, and it should be on a basis of the peak season of the year. Increased preparation space is provided by increasing the number rather than the size of preparation tables.

Storage for pans, trays, and all hand tools, should be provided as near to preparation tables as possible. Space for storing empty cans is needed either in or near the cannery. If storage is in the cannery, the space used is separated by partitions from the rest of the cannery to protect cans from rusting because of steam.

Scalding and cold-dip tanks are placed at convenient spots between washing tanks and preparation tables.

Space for can washing should be near the preparation and fill tables. Blanching and cold-dip tanks are placed near enough to each other and to preparation tables to allow for efficient operation.

Tanks for the canning medium, such as brine, sirup or hot water, usually are installed in pairs and are located adjacent to and above the filling table.

All equipment is placed to give a continuous flow of work from the receiving area to the cooling tank. Equipment using steam is placed as close to the boiler as possible, for efficient use of steam and for economy of installation. Cooling tanks are located so that retort crates may be moved by hoists from the retorts directly to the cooling tank as soon as the processing is accomplished. It is desirable also to locate the cooling tank near the cannery exit so that patrons may remove the produce as soon as the cooling is completed, without interfering with other patrons who are checking in produce or who are engaged in other canning operations.

The floor plans and equipment should be adjusted as necessary for the type of product to be canned and conditions of canning operation. It is suggested that several possible floor plans be made in order to show in detail the placement of all the equipment and the continuity of all expected operations. These plans should be studied and compared in the light of handling the expected variety of products in an efficient manner. A rough outline of the plan to be

Table 1. - Canning equipment for plants of different sizes

Item	Description	Capacity in No. 3 cans per 8-hour day 500-800 (gas unit)	1,000-1,250 (steam unit)	2,000-3,500 (steam unit)	5,000-6,000 (steam unit)
		Number	Number	Number	Number
Boiler	Upright or horizontal	—	10-15 (hp.)	20 (hp.)	30-35 (hp.)
Gas burner	30,000-75,000 B.t.u. per hour	1/ 12	—	—	—
Retort	No. 3 for 106 No. 3 cans	—	1	3	7
Do.	No. 2 for 33 No. 3 cans	1	4	3	3
Pressure cooker	14-18 No. 3 cans	6	—	—	—
Extra inset crate	No. 3 retort	—	1	2	4
Do.	No. 2 retort	1	2	2	2
Open-process tank	To accommodate inset crates	1	1	2	2-3
Steam-jacketed kettle	25-50-gallon capacity	—	1	1	1
Sealer	Commercial, rented with can contract	—	—	1	1
Do.	Bench-type, heavy-duty, power-driven, 5-6 cans per minute	—	1	2	—
Do.	Bench-type, heavy-duty, hand-operated, 3-4 cans per minute	3	1	—	—
Exhaust box	18-foot continuous	—	—	—	1
Do.	15-foot continuous	—	—	1	—
Do.	3' x 5' batch-type	—	1	2/ 2	—
Do.	3' x 4' batch-type	1	—	—	—
[illegible] hoist	¼- to ½-ton capacity	1	1	1	1
Track and carriage	500-pound capacity minimum	—	20 (feet)	30 (feet)	40 (feet)
Wash tank	2' x 2' x 10' (partitioned)	—	—	—	2
Do.	2' x 2' x 4'	—	2	3-4	—
Do.	2' x 2' x 30" - or double compartment sink	2-3	—	—	—
Scalding tank	2' x 2' x 4'	—	—	1	2
Do.	26" diameter; 36" deep	1	1	—	—
Blanch tank	2' x 2' x 4'	—	—	2	3
Do.	26" diameter; 36" deep	1	1	—	—
Cold-dip tank	2' x 2' x 4'	—	—	2	3
Do.	26" diameter; 36" deep	1	1	—	—
Can-washing tank	2' x 1' x 4'	—	—	1	1
Do.	2' x 1' x 3'	1	1	—	—
Medium tank	For brine, sirup, etc., 15-20-gallon	2	—	—	—
Do.	For brine, sirup, etc., 20-50-gallon	—	2	—	—
Do.	For brine, sirup, etc., 50-100-gallon	—	—	2	2

Footnotes at end of table.

Table 1. — Canning equipment for plants of different sizes — Continued

Item	Description	Capacity in No. 3 cans per 8-hour day			
		500–800 (gas unit)	1,000–1,250 (steam unit)	2,000–3,500 (steam unit)	5,000–6,000 (steam unit)
		Number	Number	Number	Number
Cooling tank	36" wide; 36" high; 96" long	—	—	1	1
Do.	36" wide; 36" high; 36" long	1	2	—	—
Preparation table	3' x 10' x 34" high	—	4	6–8	8–10
Do.	3' x 8' x 34" high	2	—	—	—
Stool	22" to 24" high	(optional)	(optional)	(optional)	(optional)
Fill table	3' x 10' x 34" high	—	—	—	1
Do.	3' x 8' x 34" high	—	—	1	—
Do.	3' x 6' x 34" high	1	1	—	—
Blanching basket		5	6–8	15–20	20–30
Can tray	18 No. 3 can capacity	24	36	48	72
Cutting board	Hardwood; 12" x 18"	6	12	18	24
Dishpan	12-16 quart	1 (dozen)	2 (dozens)	3 (dozens)	4 (dozens)
Dolly		2	2	3	4
Thermometer	Canning	2	3	4	4–6
Gage tester	For testing pressure gages	1	1	1	1
Gloves	For women	½ (dozen)	1 (dozen)	2 (dozens)	2 (dozens)
Do.	For men	½ (dozen)	½ (dozen)	1 (dozen)	2 (dozens)
Mill file	10" for testing can seams	6	6	12	12
Garbage can	20-gallon capacity with cover	2–3	4	6–8	8–12
Water hose	———————	(as needs require)			
Steam hose	———————	(as needs require)			

1/ Burners to be used under batch-type exhaust box.

2/ When batch-type exhaust box is used in preference to continuous-type exhaust box.

Note: – Other equipment needed will include fire extinguisher, marking equipment for cans, repair parts for equipment, tools for making repairs; and special equipment such as large sieves, pulpers, meat grinders, and lard presses as needed. Paring knives, tomato-peeling knives, vegetable knives, and butcher knives should be provided by the cannery to standardize the types and sizes desirable.

used can be developed effectively by placing cardboard models, cut to scale and representing different pieces of equipment, on a scaled floor plan of the building to be used. In placing the models in an outline of the building in various arrangements, each arrangement should be carefully studied for efficient flow of work. The final determination of the floor plan and the arrangement of the equipment should be in accord with recommendations and should be checked, if possible, by a person who has a thorough knowledge of the sequence of operation and the use of the equipment.

EQUIPMENT REQUIRED

Information on the selection, placement, and installation of equipment for small and large canning units is designed to point out some facts important to successful operation. Since equipment from different manufacturers varies, it is extremely important to study canners' supply catalogs before placing orders. (See list of manufacturers of canning equipment on page 92, also restriction on production and distribution of food-processing equipment on page 93.)

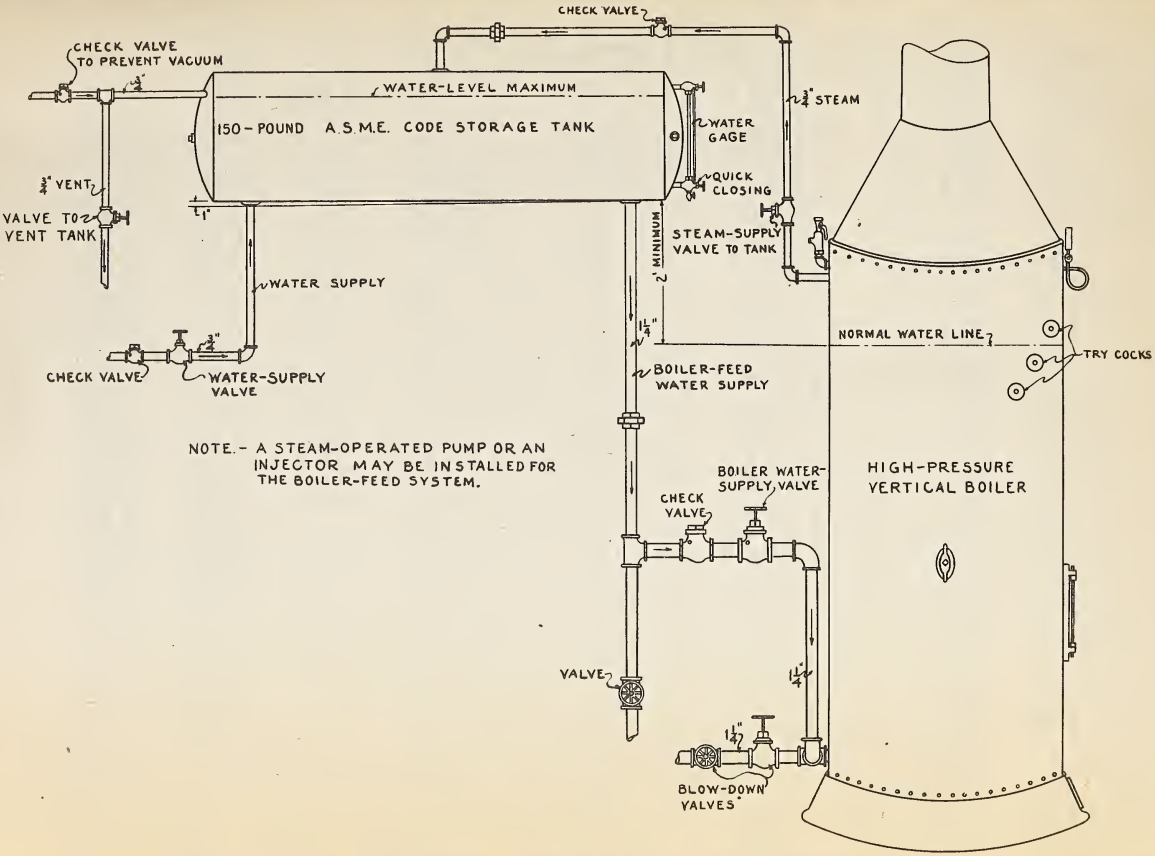
A fire-tube high-pressure boiler is considered most satisfactory for cannery use, as this type of boiler has the fastest recovery when sudden demands are made for steam. It may be either vertical or horizontal and fired with coal, gas, or oil.

Computation of the size of the boiler should be made on the basis of the steam-operated equipment that may be required to process the products available to the plant. This equipment includes retorts, open-process tanks, exhaust box, scalding and blanching tanks, tanks for the canning medium, and other equipment. Boilers used in steam canneries may range from 10 hp. to 35 hp. depending upon the anticipated capacity of the plant. Floor plans in this publication show the size of boilers that may be used for different capacities. In all cases it is preferable that the boiler size should be in excess of the anticipated needs. This will allow for expansion in the plant if necessary.

Boiler Water Feed System

All boilers should be equipped with a suitable water feed system to replenish the supply of water in the boiler as this becomes necessary. Even though in some cases the pressure of the water main servicing the plant may exceed the normal operating pressure of the boiler, it is never advisable to feed water to the boiler directly from the service main. There are several types of water feed systems, the most common of which are the boiler feed pump, the injector, and the commonly known "make-up" tank or a tank placed in an elevated position above the boiler and supplying the boiler by gravity after the pressure in the boiler and the tank have been equalized. Directions for installing and operating boiler feed pumps and injectors should be obtained from the manufacturers of such equipment. Figure 1 illustrates the installation of the elevated "make-up" tank.

Location of the boiler may be more or less predetermined by the nature of the building, or the location in relation to surrounding buildings. However, it is most desirable to have the boiler as near as possible to the various pieces of equipment using steam, thereby reducing the length of the steam service lines and increasing the efficiency of the boiler.



NOTE.- A STEAM-OPERATED PUMP OR AN INJECTOR MAY BE INSTALLED FOR THE BOILER-FEED SYSTEM.

Figure 1.--Boiler-feed system with elevated "make-up" tank.

For safety, comfort, and cleanliness, the boiler should be located outside the building if at all possible. Where boilers are installed outside the building, they should be properly housed for the protection of the equipment and the comfort of the firemen. If it is necessary to install the boiler within the building, it should be segregated by a partition from the main canning room, such partition or housing to be built in accordance with existing codes on such construction. The boiler should set level on a solid foundation, preferably of concrete.

The height of the flue or stack should be determined solely by the size and type of boiler, and the proximity of surrounding objects. The stack should be substantially constructed, properly guyed at intervals not to exceed 10 feet, and equipped with a flame arrestor.

Some Important Points To Be Considered in the Selection and Installation of Boiler, Steam and Water Lines

1. Pipe size on steam equipment such as boilers, retorts, and steam-jacketed kettles may be readily determined by the size of the tappings in such equipment. It is not considered economical to reduce these pipe sizes, since the steam needs for this equipment are predetermined by the manufacturer and smaller-size pipes would not be justified in the light of economy and efficiency.

2. Equipment such as retorts, steam-jacketed kettles, and heating coils is classified under the code of the American Society of Mechanical Engineers as unfired-pressure vessels. Unless this equipment is built in conformity with the code for such vessels and bears the seal of the National Board of the A.S.M.E., no attempt should be made to operate it on high-pressure steam. In this case a pressure-reducing valve should be installed in the line which supplies the steam to this equipment, and the low-pressure line should be properly protected by a safety valve of the same size as the diameter of the line.

3. Careful consideration should be given in the selection of materials used in the installation of high-pressure steam boilers. It is false economy to purchase cheap fittings and valves of unknown quality. Standard-make pipe, valves, and fittings of known-strength test should be used. The design and construction of water valves differ from those of steam valves and, therefore, no attempt should be made to use water valves in a steam line.

4. When cutting and fitting pipe, special care should be taken that all threads are clean and that all burrs are removed from the ends of the pipes. Failure to do this will result in unsatisfactory operation from the standpoint of leaky fittings and reduced capacity of the lines.

5. Before they are assembled, care should be taken to see that all pipes are free of loose foreign material such as filings, chips, shavings, etc., which might later lodge in and damage the delicate mechanism of such fittings as injectors and valves.

6. The boiler safety valve and blow-down valve should be attached to the body of the boiler in the respective tappings designated by the manufacturer, and no attempt should be made to attach any other steam outlet or water feed to these openings.

7. Injectors, tube cleaners, or other apparatus requiring actual flow of steam should not be connected to the water column if the boiler is equipped with such, or to the gage glass fittings, as this will cause the glass to show a false water level while such appliances are in use.

8. All steam lines should be adequately supported, and provisions should be made for the expansion of these lines when heated.

9. In installation of steam and water lines, provision should be made at every low point to provide for the draining of such lines when freezing is threatened.

10. To keep steam lines free of condensate water, blow-down valves should be arranged at the end of each line, or steam traps may be provided for this purpose.

11. A satisfactory method of heating open tanks is by the use of a perforated pipe in the bottom of the tank. When this method is employed the perforations should face the bottom of the tank in order to distribute the steam more evenly and to prevent injury to persons working over the tank. The valve controlling the pipe should be located well above the tank so that the operator will not be scalded by boiling water or steam. A union should be installed directly below this valve so the pipe may be more easily removed for cleaning the tank.

12. Where a drop line is provided for the attachment of a steam hose the connection should be made in a vertical position to prevent injury to anyone should the steam hose become loosened from the fitting.

13. All steam lines, fittings, and connections located in an exposed position in the area up to 7 feet above the floor of the plant should be properly insulated to prevent injury of persons working in the plant.

14. Steam and water lines should be properly identified by the use of different color of paint to prevent possible scalding of anyone mistaking a steam valve for a water valve.

15. Provisions should be made for the attachment of hose to the water lines at convenient places for washing floors, equipment, etc.

Gas Burners

Gas burners are the most satisfactory type of heating unit for small canning centers using pressure cookers and small retorts. They should be of sufficient number and capacity to operate pressure cookers, open-process kettles, scalding and blanching kettles, and the exhaust box at the same time. It is particularly important that the heating unit for the small retorts and pressure cookers and open-process kettles be of sufficient heating capacity to generate the required processing temperatures in approximately 10 minutes. To accomplish this, gas burners needed may range from a heating capacity of approximately 30,000 to 75,000 B.t.u. per hour. Consult your local gas company when planning your needs for a gas-operated center.

Retorts

A steam retort is a closed pressure vessel, designed to process canned foods under pressure for the purpose of sufficiently sterilizing the product to insure its keeping. All nonacid products, which include vegetables, meats, and fish, are canned under pressure. Tomatoes and fruits in the acid classification may be safely processed by the water-bath method in most areas.

When the total anticipated seasonal production is divided into acid and nonacid products an estimate can be made of the open-process and pressure-retort equipment required. The number of retorts required will depend upon the size and the daily output per retort. Retorts of 33 No. 3 can capacity and 106 No. 3 can capacity are most commonly used in community canneries. When deciding on the size of retort it should be kept in mind that smaller retorts give greater flexibility in handling small quantities or a wide variety of produce, and larger quantities are most efficiently handled in larger retorts.

The daily output per retort is computed on the basis of the number of cans per loading and the number of cycles of operation. A cycle of operation for a retort is the time consumed for loading, processing, and unloading. The length of the cycle will vary with the processing time of the product. (See table 8 on page 75.) The time required for processing varies with the size of the can and the type of product. However, on an average, six to eight cycles per retort can be completed in an 8-hour day when processing nonacid products.

All standard retorts are equipped with a pressure gage, safety valve, vent, and pet cock. It is highly desirable to have a thermometer on each retort. Retorts should meet local steam-pressure vessel codes. Each retort should be provided with a can basket preferably of heavy wire or strap iron. If perforated sheet metal is used for the basket, it should have 1-inch holes on $1\frac{1}{2}$-inch centers or the equivalent. An additional retort basket should be provided for each two retorts. This gives extra basket capacity for loading cans preparatory to processing.

Two ways to make the best use of floor space required for retort installation in a rectangular building are demonstrated in figures 2 and 3. Where it is necessary to make an installation across the narrow end of a building or in any area where the length of the installation is restricted, it is possible by proper location of the cover cranes to group the retorts in such a manner that the minimum distance between retorts is obtained. This necessitates their installation farther away from the wall than ordinarily would be necessary. Where retorts are to be installed lengthwise of a rectangular building, and where conservation of the width of the building is a prime factor, by proper cover crane location the retorts may be placed so that the distance to the wall is held to a minimum. This method requires more distance between retorts than the first method, but valuable space in front of the retorts is conserved. In all cases the distance from the wall and the distance between the retorts should be ample enough to allow a cover to swing open without striking an adjacent retort or the wall. After being alined, the retorts should be fastened securely to a low bench or supported by legs secured to the floor allowing only enough space under them for making the necessary pipe connections. A standard method of retort pipe installation, showing water, steam, and drainage connections, is presented in figures 4, 5, 6, and 7.

Retorts should be supplied with steam from a low-pressure line properly

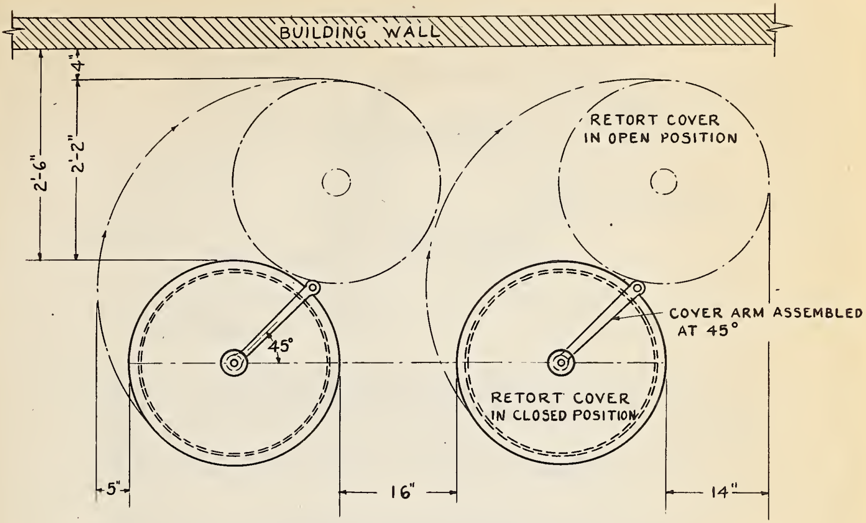


Figure 2.--Plan for installing No. 3 (106-can capacity) retorts with cover arm assembled for 45-degree swing.

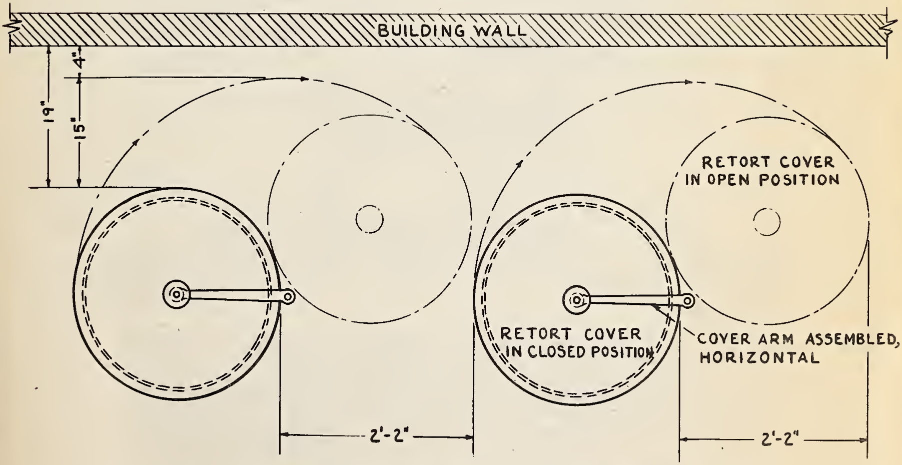
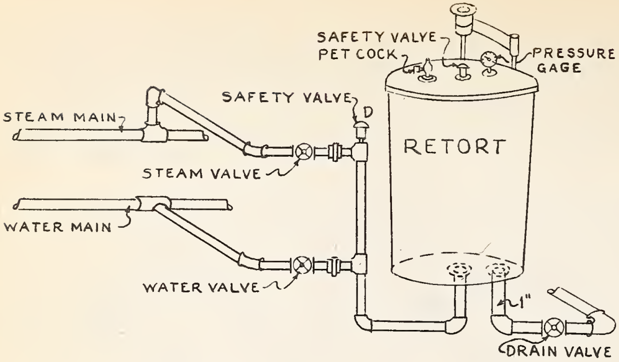


Figure 3.--Plan for installing No. 3 (106-can capacity) retorts with cover arm assembled in horizontal position.

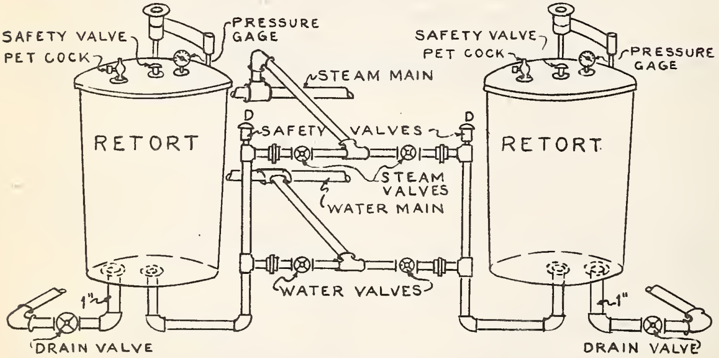


NOTES.— STEAM-AND WATER-PIPE SIZES TO BE $\frac{1}{2}$" OR $\frac{3}{4}$", ACCORDING TO THE RETORT MANUFACTURER'S RECOMMENDATION.

SEE FIGURES 2 AND 3 FOR MINIMUM SPACE REQUIRED FOR RETORT ASSEMBLY. SPACE SHOWN IS EXTENDED TO ILLUSTRATE THE PIPING AND FITTINGS.

SAFETY-VALVE "D" TO BE SET AT 25 POUNDS MAXIMUM PRESSURE. THIS VALVE MAY BE OMITTED WHEN A PRESSURE-REDUCING VALVE AND A SAFETY VALVE IS INSTALLED IN THE MAIN STEAM LINE.

Figure 4.--Diagram of piping arrangement to single retort for processing only.

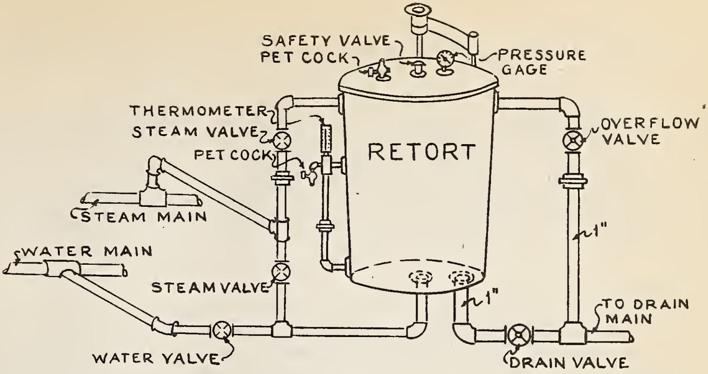


NOTES.— STEAM-AND WATER-PIPE SIZES TO BE $\frac{1}{2}$" OR $\frac{3}{4}$", ACCORDING TO THE RETORT MANUFACTURER'S RECOMMENDATION.

SPACE BETWEEN RETORTS OF 106 NO. 3 CAN CAPACITY EACH SHOULD BE 30" MINIMUM TO ALLOW FOR PIPING AND FITTINGS. SPACE SHOWN IS EXTENDED TO ILLUSTRATE PIPING AND FITTINGS ASSEMBLY.

SAFETY-VALVES "D" TO BE SET AT 25 POUNDS MAXIMUM PRESSURE. THESE VALVES MAY BE OMITTED WHEN A PRESSURE-REDUCING VALVE AND A SAFETY VALVE IS INSTALLED IN THE MAIN STEAM LINE

Figure 5.--Diagram of piping arrangement to retorts in pairs for processing only.

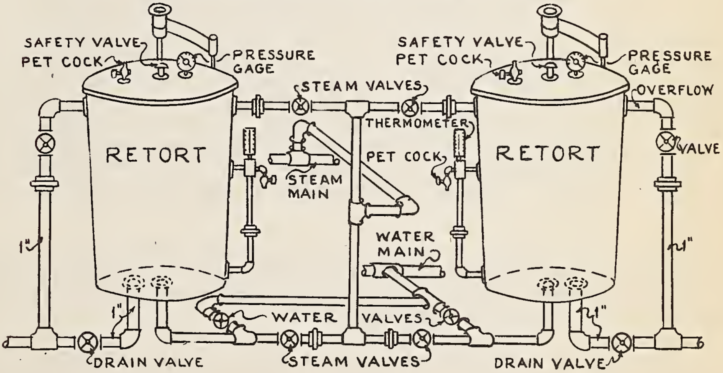


NOTES.— STEAM-AND WATER-PIPE SIZES TO BE $\frac{1}{2}$" OR $\frac{3}{4}$", ACCORDING TO THE RETORT MANUFACTURER'S RECOMMENDATION.

SEE FIGURES 2 AND 3 FOR MINIMUM SPACE REQUIRED FOR RETORT ASSEMBLY. SPACE SHOWN IS EXTENDED TO ILLUSTRATE THE PIPING AND FITTINGS.

PROVIDE A SAFETY VALVE NEAR THE PRESSURE REDUCING VALVE IN THE MAIN STEAM LINE.

Figure 6.--Diagram of piping arrangement to single retort for processing and pressure cooling.



NOTES.- STEAM-AND WATER-PIPE SIZES TO BE $\frac{1}{2}$" OR $\frac{3}{4}$", ACCORDING TO THE RETORT MANUFACTURER'S RECOMMENDATION.

SPACE BETWEEN RETORTS OF 106 NO.3 CAN CAPACITY EACH SHOULD BE 30" MINIMUM TO ALLOW FOR THE PIPING AND FITTINGS. SPACE SHOWN IS EXTENDED TO ILLUSTRATE THE PIPING AND FITTINGS ASSEMBLY.

PROVIDE A SAFETY VALVE NEAR THE PRESSURE REDUCING VALVE IN THE MAIN STEAM LINE.

Figure 7.--Diagram of piping arrangement to retorts in pairs for processing and pressure cooling.

protected by a pressure-reducing valve and a safety valve of the same size as pipes used. The safety valve should be set at approximately 5 to 10 pounds higher than the pressure at which the retorts are to be operated.

Should a pressure-reducing valve not be available, each retort should be protected by a safety valve of the same size as the steam-supply pipe line between the steam-supply valve and the retort and should be set at a pressure 2 to 5 pounds greater than that at which the retort is to be operated. However, this feature need not be considered if the safety valve on the retort cover is of the same diameter as the steam control valves. Each retort is connected to a pipe drain.

Pressure Cookers

The 14 No. 3 can capacity pressure cooker is the smallest size that can be used with any degree of efficiency in a community cannery. This size cooker will process approximately 90 No. 3 cans in an 8-hour day, the capacity varying with the type of product processed. The number of pressure cookers required should be determined on the same basis as that recommended for determining the number of retorts.

Open-process Tanks

Open-process tanks or kettles are required for processing acid products by the water-bath method. The open-process tank should be the same size as the retort so that the baskets from the retorts may be utilized also for water-bath processing. As in the case of retorts, the required number of baskets for open-process tanks should be in the ratio of $1\frac{1}{2}$ baskets per tank. Open-process tanks may be improvised by using oil drums or similar containers of the proper size and they need not be equipped with a cover. They should be provided with a perforated false bottom under which is a high-pressure steam inlet and drain. Where tanks or oil drums of suitable size to accommodate a retort basket are not available it is possible to improvise a can basket by using a slightly smaller drum or tank and perforating it to allow free circulation of water through the basket. These containers also should be large enough for covering the cans with at least 1 inch of water. (Figure 8 illustrates an improvised open-process tank and basket.)

In smaller canning units, a wash boiler, fitted with a metal or wooden false bottom perforated to allow circulation of water under the cans, makes a satisfactory open-process tank. Wire baskets to hold cans should be provided in the same ratio as for larger open-process tanks.

When computing the number of open-process tanks or kettles needed it should be kept in mind that with proper scheduling of produce to be canned retorts may be available to use during a part of the day for water-bath processing. Where it is impractical to use a water bath because of restricted water supply it may be desirable to eliminate the water-bath method in favor of a retort operated at approximately 2 pounds steam pressure and for the same length of time as is used with open-process tanks.

Because of the relatively short periods required for processing acid products, at least 8 to 10 cycles per canner per day may be completed and in some instances with certain products this number would be greatly increased.

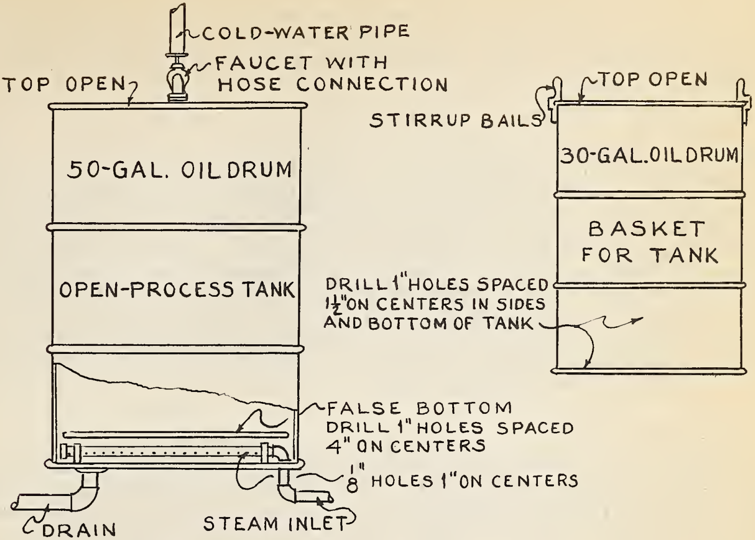


Figure 8.--Detail of open-process tank.

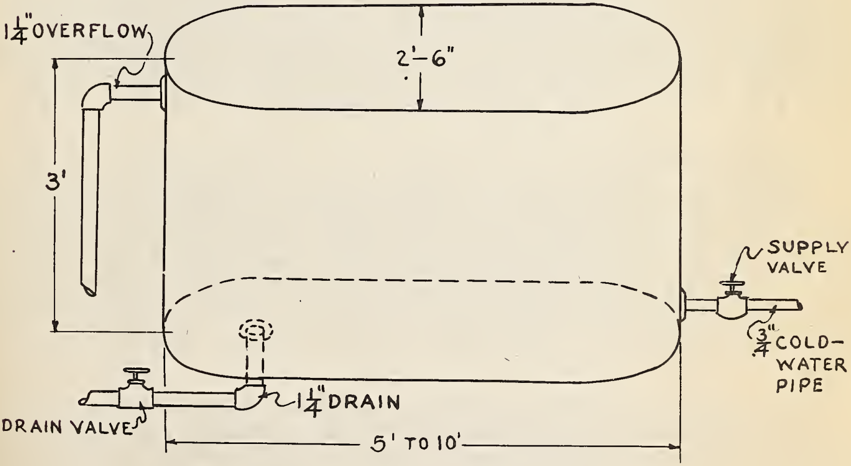


Figure 9.--Detail of cooling tank.

Knowing the number of cycles per open-process tank per day and the can capacity of each tank, the committee may determine the number of cans required, using the same method as in determining the number of retorts for nonacid products. Diagrams of open-process tanks also show the installation features required in a steam-operated unit.

Cooling Tank

To make the most efficient use of retorts a cooling tank should be provided for cooling those products in cans of a size that do not require cooling under pressure. Metal cooling tanks are preferable because they are easy to keep clean and may be readily moved if necessary. Cooling-tank capacity should be sufficient to accommodate one basket for every three retorts or water-bath canners. The tank should be provided with a cold-water inlet at the bottom and an overflow pipe slightly above the height of the basket to carry the heated water to the drain. The cold-water inlet and the overflow pipe should be arranged in opposite ends of the tank so there will be an even distribution of cold water throughout the tank. (Figure 9 illustrates the proper location of pipes in the cooling tank installation.)

Chain Hoist and Track

A chain hoist of $\frac{1}{4}$- to $\frac{1}{2}$-ton capacity attached to a track or crane is necessary for lifting baskets in and out of retorts or cooling tanks. A hoist of $\frac{1}{2}$-ton capacity should be used with a No. 3 retort in order to provide the needed safety margin. The track should be long enough to extend over the retorts to allow space for the retort baskets to be picked up and unloaded beyond the cooling-tank area. In plants using a hoist and overhead track to facilitate handling of loaded retort baskets, the retorts, hot-water baths, and cooling tanks should be installed in line so that the track passes directly over the center of each. The track should extend well beyond the end of the complete retort and cooling tank installation to make it possible to pick up loaded baskets and let them down onto the floor or onto low-wheeled trucks. A heavy-duty garage-door track or hay track or a standard canner's rail and trolley may be used. The track should be installed high enough for the hoist to lift a basket clear of the retorts and the cooling tank.

Steam-jacketed Kettles

Steam-jacketed kettles of 25- to 50-gallon capacity are used for rendering lard and for making jams, jellies, fruit butters, and soup stock. They should be located near the can sealer as the products heated in these kettles are filled directly into the cans which are taken without exhausting to the sealer. When steam-jacketed kettles are used for the purposes mentioned they should be installed in an elevated position so that the faucet or discharge pipe is above a small table which is used for filling cans. When they are to be used for heating meat it is desirable to install them at a lower operating level.

Steam-jacketed kettles for community canneries should be of Monel metal or aluminum to permit their use for the widest variety of products. An automatic pressure-reducing valve should be installed in the feeder line to the kettles. It should be set 5 to 10 pounds higher than the recommended operating pressure of the kettle. A safety valve should be installed between the manually operated valve and the kettle.

Sealers

A can sealer is a machine designed to form the double seam which attaches the cover to the can in such a manner as to effect a hermetic closure. From the smallest hand-powered sealer to the large high-speed automatic power-driven sealer the method of accomplishing this work varies widely. However, the basic principle is the same in all makes and models since the results they achieve are identical. The anticipated output of the plant, therefore, would determine the size and type of the machine to be used. It is recommended that only a machine of sturdy construction and ample capacity be selected. The approximate number of cans that would need to be sealed per hour to meet the daily anticipated production should serve as a basis for determining the size and number of sealers to be installed. When small hand-operated sealers are used it is best to have one for each size can used, as considerable time is lost in changing and adjusting sealers for a change in the size of can. A more desirable sealer for any but very small canning plants is the bench type motor-driven sealer that has a capacity of approximately 300 cans per hour. In canning plants having a capacity of over 2,000 cans per day an automatic power-driven sealer should be rented with the can contract. A commercial type sealer will be needed also when No. 10 cans are used.

Because of the complex nature of power-driven closing machines considerable time may be lost in securing a trained person to make necessary adjustments or to repair breakdowns. For this reason, it is advisable that where automatic power-driven sealers are used a heavy-duty hand-operated or electric can sealer be kept in readiness so that the production schedule will not be too seriously disrupted in case of failure of the power closing machine.

The can sealer should be located as near the exhaust box as possible and fastened securely to the bench or table on which it is located so that it may be operated with a minimum of effort. On power-driven automatic closing machines it is often possible to install the exhaust box at the proper height for delivering the cans directly onto the indexing plate of the closing machine, thereby relieving the operator of handling them.

Sealer Tables

Tables of sturdy construction are needed for mounting either electric or hand sealers. The sealer table may be built 3 feet square with a top of 2-inch lumber and having an edge of at least 2 inches to extend out over the edge of the table for fastening sealers. The height of the table should be approximately 32 inches for hand sealers and 36 inches for electric sealers. On power-driven models all electric service should be installed in accordance with local codes and all such machines should be properly grounded for the protection of the operator. The control switch should be convenient to the operator.

Exhaust Boxes

The purpose of the exhaust box is to heat the contents of the can to the proper temperature for sealing. It may be either the continuous or batch type, the type being governed by factors such as the estimated daily needs and type of products to be exhausted.

The continuous-type exhaust box is a covered conveyer containing steam pipes for heating the cans which are carried through it and delivered to the sealer at the proper temperature for sealing. The length of this type of box may be estimated on the basis of the number of cans to be exhausted, the time required to exhaust the product and the can-carrying capacity per foot of conveyer. A conveyer may be either a single chain type or a woven metal belt, the latter having the greatest can-carrying capacity. Larger plants will no doubt find the continuous-type box more satisfactory for steady operation.

The batch-type exhaust box is a covered box or shallow tank heated either by steam from a boiler or by stoves or burners placed under the box. In the latter case the box is either filled with water deep enough to heat the cans by contact or with only enough water to manufacture steam for heating. The size of the batch-type exhaust box may be determined by computing the time required for the loading, exhausting, and unloading operations which constitute a cycle. The number of cycles in a day divided into the daily anticipated production would give the required capacity in cans per cycle. The size of the box would then be governed by the area required to hold that many cans at one time.

All exhaust boxes should be constructed either of wood with metal lining or of all metal with insulation. Obviously, all boxes heated by stoves or burners require all-metal construction. Batch-type boxes should be equipped with a perforated false bottom to allow circulation of steam or water underneath the cans. A batch-type exhaust box in which water is used to heat the cans should be provided with an overflow outlet pipe so located as to prevent the level of the water from rising over 2 inches from the top of the cans. A water inlet pipe may be provided beneath the false bottom or water may be supplied from a faucet or hose over or near the box. Both types of exhaust boxes should be provided with facilities for drainage. Vents located in the top of the continuous exhaust box, provided to remove vapor and increase the circulation of live steam in the box, are connected to room ventilators. Covers for both type exhaust boxes should be constructed so that the cover is higher in the center than at the outside. This prevents condensation, which naturally forms on the underneath side of the cover, from dripping into the contents of the can as the water follows the slope of the cover to the outside edges before dripping back into the box. (Figure 10 shows batch-type exhaust box.)

Wash Tanks

Wash tanks of metal are desirable for washing produce since they can be cleaned easily. Tanks 2 feet wide, 2 feet deep, and from 4 feet to 6 feet long will hold water in sufficient quantities for thorough washing of produce. Livestock watering tanks make satisfactory wash tanks. A two-compartment sink of sufficient width and depth is also satisfactory for small canneries. All wash tanks should be provided with a drain at the bottom so that tanks may be easily drained. (Figure 11 shows installation of a wash tank.) A false bottom of $\frac{1}{4}$-inch mesh hardware cloth, placed 6 inches from the bottom of the tank, facilitates washing by allowing sand and dirt to fall to the bottom of the tank.

Scalding and Blanching Tanks

Tanks, preferably of heavy metal, equipped with drains and perforated steam pipes for heating water, are essential for scalding and blanching operations. The number and size required will depend upon the daily capacity of the plant and the type of product to be processed. In all cases the tanks should be large enough to permit introduction of the product into the tank without changing the temperature of the water more than a few degrees. Oil drums may be cut to the desired height and used as blanch tanks. Wash boilers or galvanized tubs make satisfactory scalding and blanching tanks for small units. Scalding and blanching tanks may be used interchangeably, depending upon the seasonal needs. (Figure 12 illustrates scalding and blanching tanks.)

Cold-dip Tanks

Cold-dip tanks of metal for cooling scalded and blanched products may be identical with wash tanks. They are installed adjacent to the blanching and scalding tanks.

Can-Washing Tanks

A small tank, preferably of metal, is needed for washing cans. A watering tank, 2 feet wide, 1 foot deep, and 4 feet long, provided with a drain and a cold-water inlet, is satisfactory for this purpose. (See figure 13.)

Tanks for the Medium

Tanks used for the canning medium should be of noncorrosive metal and for small plants they should be of a minimum capacity of 15 to 20 gallons. In large plants, tanks of 50- to 100-gallon capacity are recommended for the medium. They should be installed in pairs to provide enough tank capacity so that there will be ample time for one tank to be filled and heated while the other is being used. (See figure 14.) Wooden tanks should not be used for this purpose. Medium tanks in steam units should be located adjacent to and at a convenient height above the filling table for drawing the medium off into the cans. Stock pots fitted with a spigot make a satisfactory medium tank for small plants. The size and number of tanks required will vary with the type and capacity of the plant.

Preparation Tables

A convenient size for tables used in preparing produce is 3 feet wide, 10 feet long, and 34 inches high. (See figure 15 showing preparation table.) A table of this size accommodates 4 persons at each side. The top of the table should have a smooth surface with no cracks or pores that would provide a source of contamination. It may be of masonite, plastic, water-proofed plywood, enamel, linoleum, sheet metal, or of tongue and groove flooring painted with a good grade of enamel or deck paint. Unpainted wooden-top tables are difficult to keep clean and therefore are not recommended.

Stools

It may be desirable to provide stools for patrons to permit them to be seated while working. However, experience has shown that the average patron is at preparation tables but a short length of time and prefers to stand at his work. When stools are used, those with adjustable foot racks are preferable. Chairs are usually too low and benches are too inconvenient for efficient work. The number of stools required will be determined by the number of persons that the cannery will accommodate at one time.

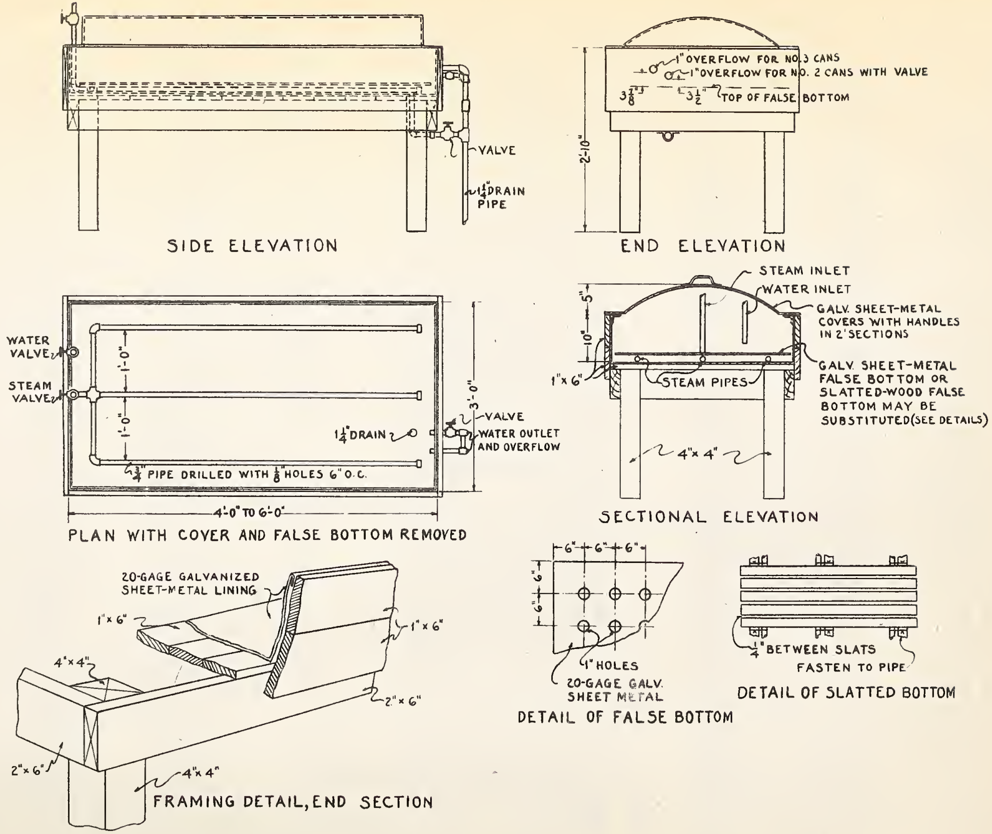

SIDE ELEVATION
VALVE
1¼" DRAIN PIPE
END ELEVATION
1" OVERFLOW FOR NO. 3 CANS
1" OVERFLOW FOR NO. 2 CANS WITH VALVE
3⅞"
3½"
TOP OF FALSE BOTTOM
2'-10"
PLAN WITH COVER AND FALSE BOTTOM REMOVED
WATER VALVE
STEAM VALVE
1'-0"
1'-0"
3'-0"
VALVE
WATER OUTLET AND OVERFLOW
1¼" DRAIN
¾" PIPE DRILLED WITH ⅛" HOLES 6" O.C.
4'-0" TO 6'-0"
SECTIONAL ELEVATION
STEAM INLET
WATER INLET
GALV. SHEET-METAL COVERS WITH HANDLES IN 2' SECTIONS
GALV. SHEET-METAL FALSE BOTTOM OR SLATTED-WOOD FALSE BOTTOM MAY BE SUBSTITUTED (SEE DETAILS)
5"
10"
1"x 6"
STEAM PIPES
4"x 4"
FRAMING DETAIL, END SECTION
20-GAGE GALVANIZED SHEET-METAL LINING
1"x 6"
1"x 6"
4"x 4"
2"x 6"
2"x 6"
4"x 4"
DETAIL OF FALSE BOTTOM
6"
6"
6"
6"
6"
1" HOLES
20-GAGE GALV. SHEET METAL
DETAIL OF SLATTED BOTTOM
¼" BETWEEN SLATS
FASTEN TO PIPE

Figure 10.--Batch-type exhaust box operated by steam.

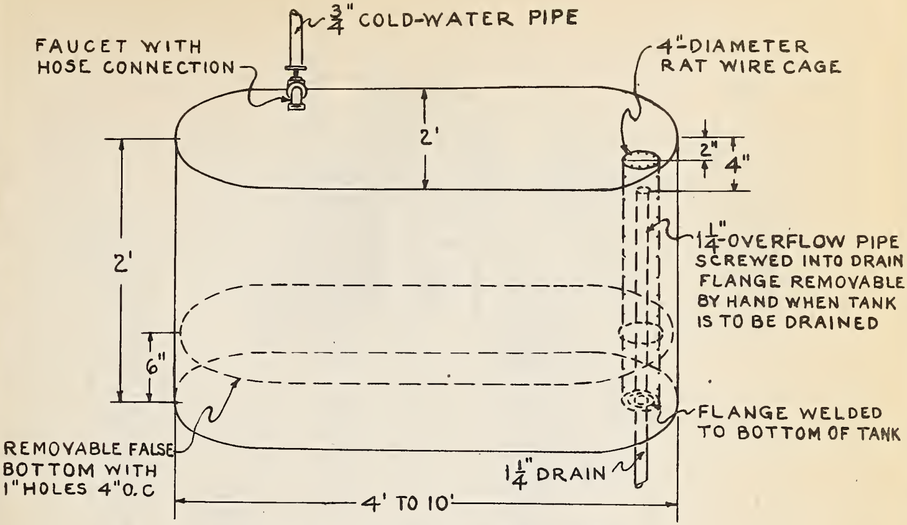

3/4" COLD-WATER PIPE
FAUCET WITH HOSE CONNECTION
4"-DIAMETER RAT WIRE CAGE
2'
2"
4"
2'
1 1/4" OVERFLOW PIPE SCREWED INTO DRAIN FLANGE REMOVABLE BY HAND WHEN TANK IS TO BE DRAINED
6"
FLANGE WELDED TO BOTTOM OF TANK
REMOVABLE FALSE BOTTOM WITH 1" HOLES 4" O.C
1 1/4" DRAIN
4' TO 10'

Figure 11.--Detail of washing tank.

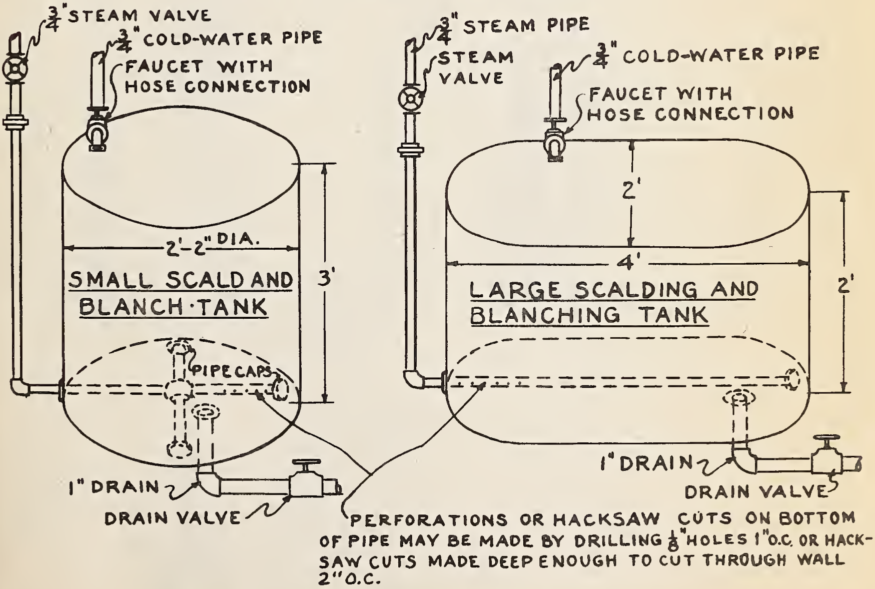

3/4" STEAM VALVE
3/4" COLD-WATER PIPE
FAUCET WITH HOSE CONNECTION
2'-2" DIA.
SMALL SCALD AND BLANCH·TANK
3'
PIPE CAPS
1" DRAIN
DRAIN VALVE
3/4" STEAM PIPE
STEAM VALVE
3/4" COLD-WATER PIPE
FAUCET WITH HOSE CONNECTION
2'
4'
2'
LARGE SCALDING AND BLANCHING TANK
1" DRAIN
DRAIN VALVE
PERFORATIONS OR HACKSAW CUTS ON BOTTOM OF PIPE MAY BE MADE BY DRILLING 1/8" HOLES 1" O.C. OR HACKSAW CUTS MADE DEEP ENOUGH TO CUT THROUGH WALL 2" O.C.

Figure 12.--Detail of scalding and blanching tanks.

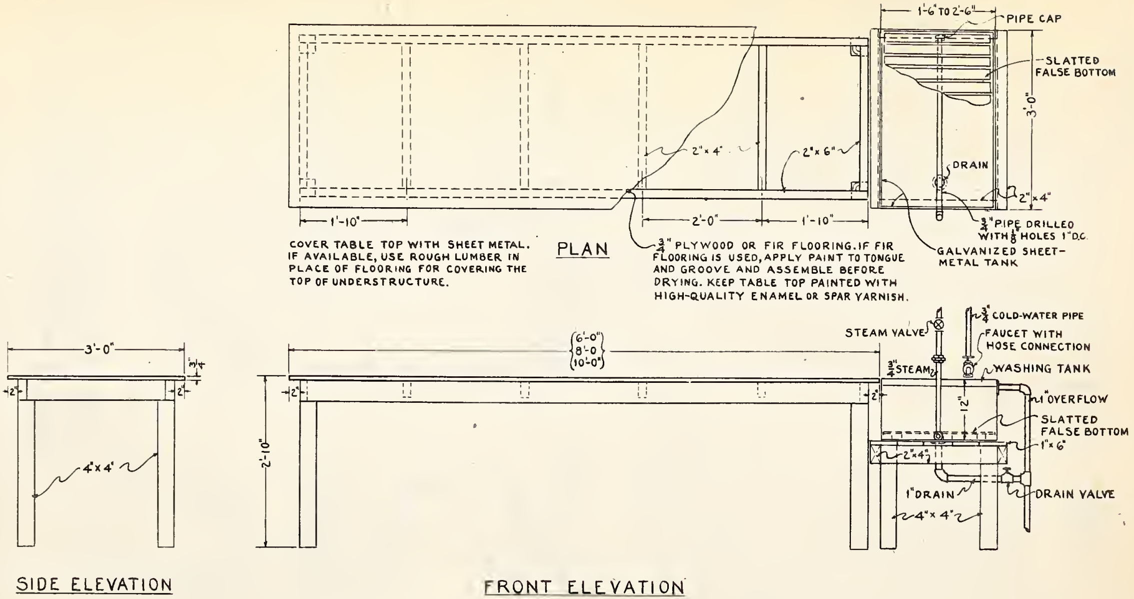

1'-6" TO 2'-6"
PIPE CAP
SLATTED FALSE BOTTOM
3'-0"
2" x 4"
2" x 6"
DRAIN
2" x 4"
3/4" PIPE DRILLED WITH 1/8" HOLES 1" O.C.
GALVANIZED SHEET-METAL TANK
1'-10"
2'-0"
1'-10"
COVER TABLE TOP WITH SHEET METAL. IF AVAILABLE, USE ROUGH LUMBER IN PLACE OF FLOORING FOR COVERING THE TOP OF UNDERSTRUCTURE.
PLAN
3/4" PLYWOOD OR FIR FLOORING. IF FIR FLOORING IS USED, APPLY PAINT TO TONGUE AND GROOVE AND ASSEMBLE BEFORE DRYING. KEEP TABLE TOP PAINTED WITH HIGH-QUALITY ENAMEL OR SPAR VARNISH.
3'-0"
3/4"
2"
2"
4" x 4"
SIDE ELEVATION
(6'-0" 8'-0 10'-0")
2"
2'-10"
2"
STEAM VALVE
3/4" COLD-WATER PIPE
FAUCET WITH HOSE CONNECTION
3/4" STEAM
WASHING TANK
12"
1" OVERFLOW
SLATTED FALSE BOTTOM
1" x 6"
2" x 4"
1" DRAIN
DRAIN VALVE
4" x 4"
FRONT ELEVATION

Figure 13.--Detail of fill table and can-washing tank.

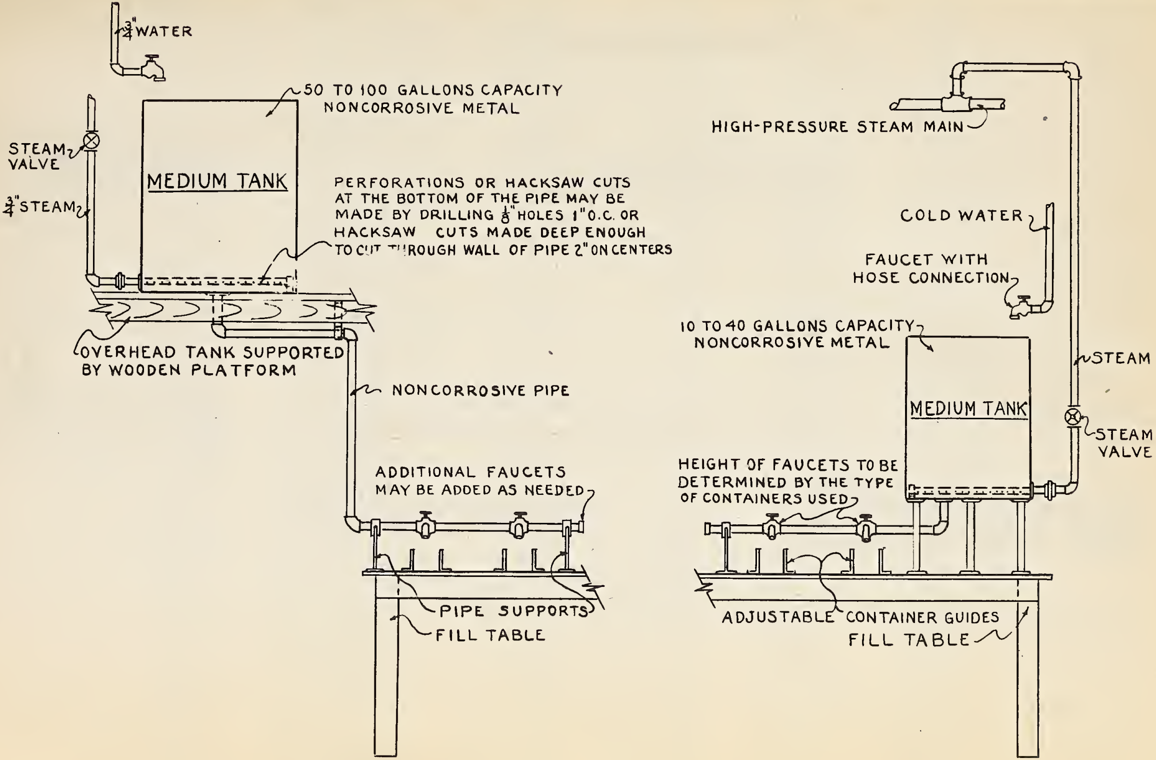
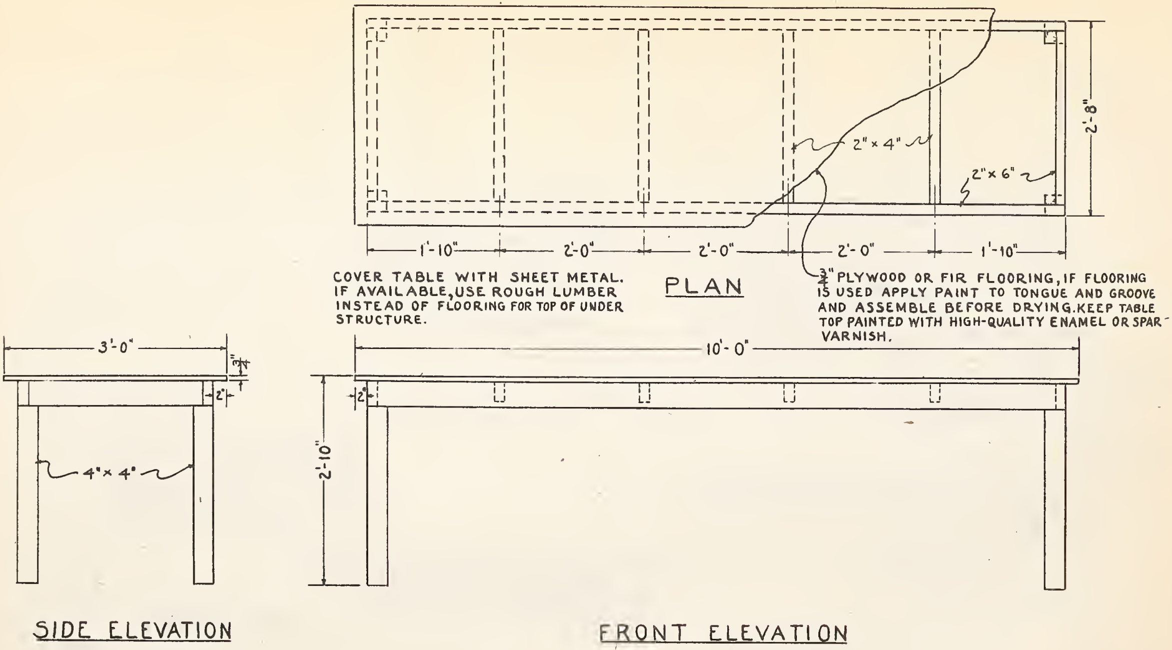

$\frac{3}{4}$" WATER
50 TO 100 GALLONS CAPACITY NONCORROSIVE METAL
STEAM VALVE
MEDIUM TANK
$\frac{3}{4}$" STEAM
PERFORATIONS OR HACKSAW CUTS AT THE BOTTOM OF THE PIPE MAY BE MADE BY DRILLING $\frac{1}{8}$" HOLES 1" O.C. OR HACKSAW CUTS MADE DEEP ENOUGH TO CUT THROUGH WALL OF PIPE 2" ON CENTERS
OVERHEAD TANK SUPPORTED BY WOODEN PLATFORM
NONCORROSIVE PIPE
ADDITIONAL FAUCETS MAY BE ADDED AS NEEDED
PIPE SUPPORTS
FILL TABLE
HIGH-PRESSURE STEAM MAIN
COLD WATER
FAUCET WITH HOSE CONNECTION
10 TO 40 GALLONS CAPACITY NONCORROSIVE METAL
STEAM
MEDIUM TANK
STEAM VALVE
HEIGHT OF FAUCETS TO BE DETERMINED BY THE TYPE OF CONTAINERS USED
ADJUSTABLE CONTAINER GUIDES
FILL TABLE

Figure 14.--Assembly of tanks for the medium.



COVER TABLE WITH SHEET METAL. IF AVAILABLE, USE ROUGH LUMBER INSTEAD OF FLOORING FOR TOP OF UNDER STRUCTURE.

3/4" PLYWOOD OR FIR FLOORING, IF FLOORING IS USED APPLY PAINT TO TONGUE AND GROOVE AND ASSEMBLE BEFORE DRYING. KEEP TABLE TOP PAINTED WITH HIGH-QUALITY ENAMEL OR SPAR-VARNISH.

Figure 15.--Detail of preparation table.

Fill Tables

Fill tables should be placed adjacent to can-washing tanks and the exhaust box for best working arrangements. They are 34 inches high and 4 to 6 feet long, depending on the type of product canned and the number of patrons needing to be accommodated at one time. (See figure 13 showing fill table with can-washing tank.)

Blanching Baskets

Blanching baskets of No. 6 mesh galvanized hardware cloth of not more than 18-quart capacity should be provided for blanching or scalding produce. Galvanized wire potato picking baskets of one-half-bushel capacity and lined with No. 6 mesh hardware cloth make excellent blanching baskets.

Can Trays

Trays of wire frame for carrying cans to washing tank, fill table, and exhaust box are desirable. Trays should hold from 15 to 18 No. 3 cans. Wooden trays with a capacity of 12 No. 3 cans are also useful.

Cutting Boards

Cutting boards of hardwood are needed for general use. A corn-cutting board also is needed where corn is canned. (See instructions on page 88 for canning corn.)

Dishpans

Pans made of aluminum, tin, or enamel, of 12- to 16-quart size, should be provided for preparation of produce. The number of pans needed will be determined by the number of patrons that can be accommodated at preparation tables. An average of two pans should be allowed for each patron.

Cutlery

Although most community canneries require that patrons provide their own cutlery for the preparation of produce, it is recommended that canneries purchase such equipment in order to standardize the type and size best suited for their use. All cutlery should be of high-quality carbon steel of an approved design. Unpainted handles are preferred. Blades should be riveted to handles. Sharpening steels should be equipped with guards. Stainless-steel kitchen cutlery is not desirable since it does not retain a sharp edge under canning conditions.

Canning Thermometers

Canning thermometers of the red-liquid pocket type, with a temperature range of zero to 220° F., are recommended for checking sealing temperatures. Every canning unit should have a minimum of two thermometers and two replaceable graduated glass tubes for thermometers.

Gloves

Gloves may be used for handling hot cans and equipment. They should be loose-fitting at the wrist so they can be quickly removed in case of emergency. The use of gloves may save much time in handling hot containers. However, employees and patrons should be cautioned that continual use of gloves may cause hands to become tender and susceptible to infection.

Mill Files

At least six 10-inch mill files should be available in every canning unit for use in checking tightness and condition of can seams. (Figure 16 shows method of checking can seams.)

Dollies

Dollies are necessary for moving produce, cans, and equipment. They may be of metal or wood and should have ball-bearing wheels to facilitate easy movement of heavy loads. The frame should be substantial enough to support retort baskets filled with cans. (See figure 17 for construction of utility truck or dolly.)

Garbage Cans

Refuse and trash containers should be provided to give sufficient capacity for at least 1 day's accumulation of refuse. These should be of metal with close-fitting covers and should be watertight. Galvanized buckets are needed for general use, such as carrying out garbage.

Steam Connections, Steam and Water Hose

Steam connections and steam hose should be provided near the equipment that needs to be cleaned by steam. Steam hose may also be used for heating water. Water hose is needed in large canneries for cleaning floors, tables, and similar equipment.

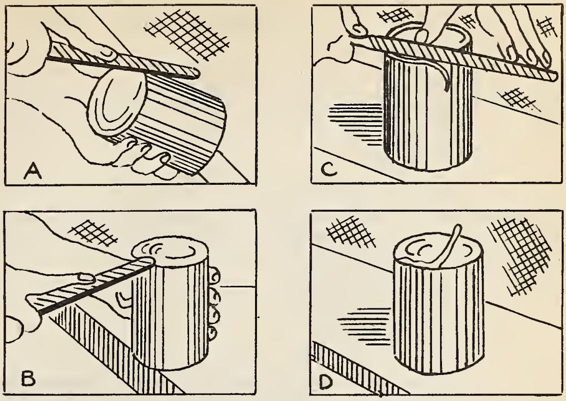
Fire Extinguishers

If wood or coal is used as fuel and no oil, gas, or gasoline is used in the building, a soda-acid type of extinguisher will be adequate, or if a reliable source of water is available, a suitable pump or hose will be sufficient. If oil or gas is used as fuel, one 15-pound Dugas dry-powder type hand fire extinguisher should be installed in addition to the water extinguishers. Installation of any safety device should be checked by a safety engineer.

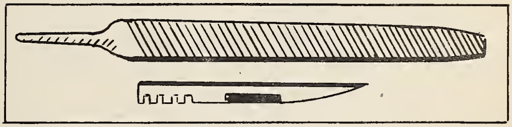
Tools for Adjusting and Repairing Equipment

Tools for adjusting and repairing equipment should be kept in a definite place so they may be readily available when needed. Loss of tools may mean loss of production hours. Tools required for adjusting and repairing equipment should include:

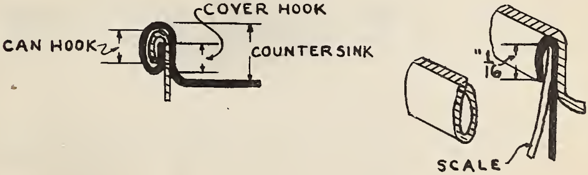
1 hammer
1 saw
1 square
1 pipe vise
2 18-inch pipe wrenches
1 set of open end wrenches
1 set of pipe-threading equipment
1 6-inch screw driver
1 12-inch screw driver
1 hack saw and blades



Filing a can's double seam to determine whether seaming has been done correctly or not. A, File a notch through at the body seam to the body of the can; B, starting at notch file barely through the first thickness of plate for a distance of about 1 to 2 inches; C, use file to force down the cover hook, the narrow thickness of plate as shown; D, bend the cover hook up, as shown, for observation and measuring of the can hook.



Flat file used in filing cans and thin metal ruler used in measuring can body hook, can lid hook, and width of seams. The notches in ruler are for measuring width of the double seam.



Left, diagram of double seam showing can hook, cover hook, and countersink. Right, showing method of testing depth of can hook; this should be 1/16 inch.

Figure 16.--Method of checking can seams.

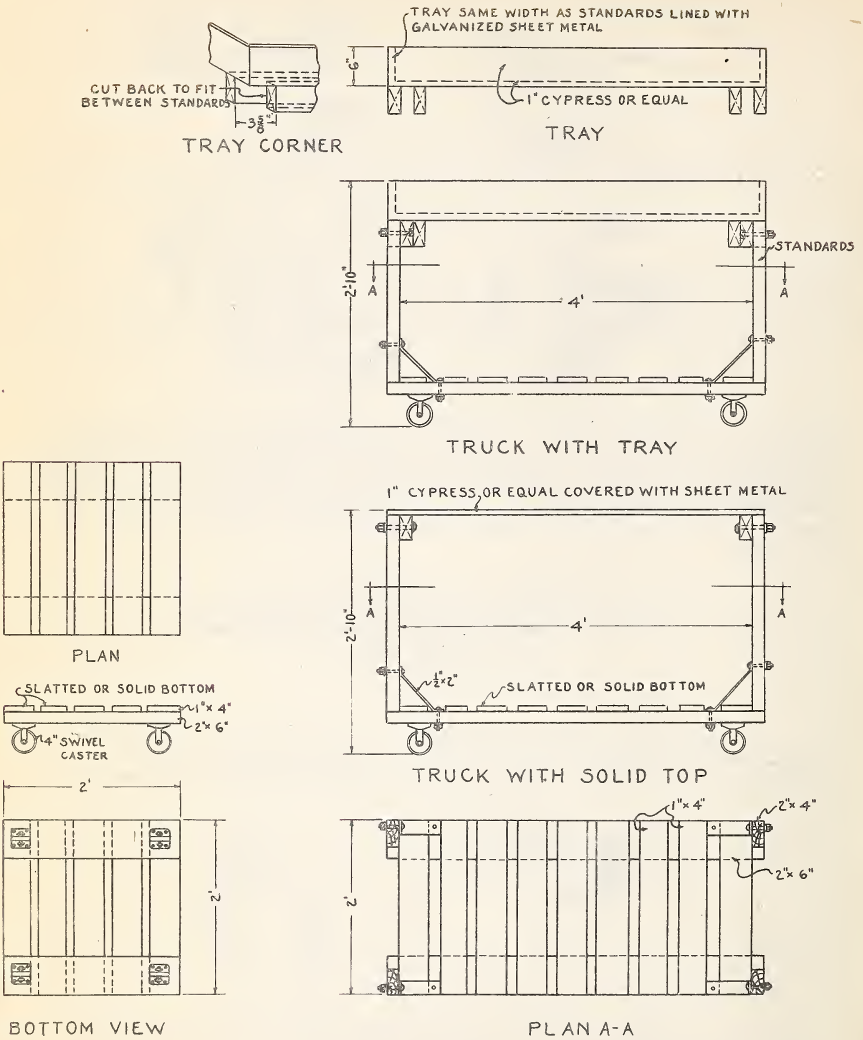


Figure 17.--Utility trucks for canning units.

Sharpening Equipment

Sharpening equipment, such as grindstones and oilstones, should be provided in each canning center for the sharpening of tools.

Can-testing Equipment

A can opener and a tray for samples should be provided for use when inspecting cans of processed foods.

Parts

A supply of extra parts should be kept on hand at the cannery to replace or repair those parts that may break or wear out quickly under constant use. This will avoid delay in operation. The following items should be the minimum kept in stock:

For retorts:

Wing nuts - 1 extra for each retort
Eye bolts - 1 extra for each retort
Gaskets - 1 extra for each 3 retorts
Pressure gage - 1 extra for each 3 retorts
Safety valve - 1 extra
Thermometer - 1 extra

For pressure cookers:

Wing nuts - 1 extra for each cooker used
Gasket - 1 extra for each cooker
Safety valve - 1 extra
Pressure gage - 1 extra for each 5 cookers
Safety plug - 1 extra

For sealers:

Seaming rolls - 1 set for each sealer
Sealer arms - 1 set
Adjusting screws, springs, and hand washers or rubber pads as required for base plates.

Other items needed will depend on the type of sealer used. Sealers should be given periodic inspection for worn parts.

For boilers:

2 water-gage glasses and packing washers
2 sets of hand plate gaskets
1 fusible plug

For plumbing:

Valve seats for all types of replaceable seat valves
Pipe joint compound
Thread-cutting oil

Cleaning Equipment

Cleaning equipment, consisting of brooms, mops, squeegees, scrub brushes, and cleaning cloths should be provided. Such items should be kept together in a storeroom provided for that purpose.

CONTAINERS GENERALLY USED

Type of Finish

Three types of finish in containers generally used for canning are: plain tin, C-enamel, and R-enamel, also called Standard enamel. Enameled cans are not necessary to insure a wholesome product but are used to prevent discoloration which occurs with some products when plain tin is used. C-enamel cans are used to prevent discoloration which occurs when nonacid products containing sulfur are placed in plain tin. R-enamel cans are used to prevent the loss of color which occurs when highly colored fruits and beets are placed in plain tin.

Type of Plate

The tin plate used in manufacturing cans is referred to as Type L and Type M plate. Type L plate is made from cold-rolled tin plate which is more resistant to corrosion than Type M and therefore makes possible a longer storage period for highly corrosive products.

The following table gives the recommended type of container most satisfactory for various products.

Table 2. - Recommended type of container for specified products

Product	Type of plate	First choice	Second choice
Applesauce	L	Plain	
Apricots	L	Plain	
Asparagus	M	Plain	C-enamel lids
Beans, green & wax	M	Plain	
Beans, green lima	M	C-enamel	Plain
Beets	M	R-enamel	C-enamel
Berries	L	R-enamel	
Carrots	M	C-enamel	Plain
Cherries, dark	L	R-enamel	
Cherries, light	L	Plain	
Corn	M	C-enamel	
Greens	M	Plain	
Peas	M	Plain	C-enamel
Peaches	M or L	Plain	
Pears	M or L	Plain	
Plums	L	R-enamel	
Pumpkin	M	R-enamel	C-enamel
Sauerkraut	L	Plain	R-enamel
Tomatoes	M	Plain	R-enamel
Tomato juice	M	Plain	

Size of Cans

The number of can sizes used in a community cannery should be limited because the processing time differs for the various sizes and because the time involved in changing the sealer may delay the canning operation. Sizes most commonly used for community and school-lunch or institution canning are given in table 3.

Table 3.- Size and description of cans commonly used

Size of can	Dimensions (in inches)		Factory symbols	Volume of cans in cups	Average net weight (ounces)
	Diameter	Height			
No. 2	3 7/16	4 9/16	307 x 409	2 1/2	20
No. 2 1/2	4 1/16	4 11/16	401 x 411	3 1/2	28
No. 3	4 4/16	4 14/16	404 x 414	4	38
No. 10	6 3/16	7	603 x 700	13	110

Purchase of Cans

When a large production is expected and space is available for storage it is desirable from a standpoint of expense and convenience to purchase the season's supply of cans at one time. A carlot of No. 2 cans would range from 50,000 to 97,000 cans and of No. 3 cans from 36,000 to 50,000, depending on the length of the car. Cans should be shipped in bags or cartons to minimize damage in shipment and storage and to keep cans clean until they are used.

Table 4 gives the approximate number of cans required for a measured quantity of some of the more common fruits and vegetables.

Table 4. - Approximate number of cans required for measured quantities of produce

Product	No. 2 cans	No. 3 cans	No. 10 cans
Apples........1 bu. (50 lbs.)	30	20	6
Beans, lima (in shell)........1 bu. (28 lbs.)	10	8	3
Beans, green and wax........1 bu. (24 lbs.)	21	16	4
Beets (without tops)........1 bu. (60 lbs.)	32	24	7
Berries........24-qt. crate (40 lbs.)	24	18	6
Carrots........1 bu. (50 lbs.)	30	20	6
Cherries........1 bu. (56 lbs.)	34	25	7
Corn (green sweet)........1 bu. (35 lbs.)	12	[1]9	5
Grapes........1 bu. (48 lbs.)	26	20	6
Greens........1 bu. (12 lbs.)	10	7	2
Peaches........1 bu. (50 lbs.)	30	20	5
Peas (green, in shell)........1 bu. (30 lbs.)	32	24	3
Plums........1.bu. (60 lbs.)	45	30	9
Squash........1 bu. (40 lbs.)	30	20	6
Strawberries........24-qt. crate (40 lbs.)	16	12	-
Sweetpotatoes (fresh harvest)..1 bu. (52 lbs.)	30	20	6
Tomatoes........1 bu. (56 lbs.)	22	15	5

---

[1] Whole-grain.

EDUCATION AND TRAINING

If the community cannery is to operate successfully and become a permanent community facility, all groups of people using the cannery must become increasingly skilled in its use and operation and be willing to support it.

So that the cannery may be effective, an educational program should be conducted on: (1) planning, (2) producing, and (3) conserving the family food supply. It should begin before the planting season of the products which are to be conserved. Individuals enrolled in any part of this educational program should be organized into groups of teachable size based on: (1) size of the cannery, (2) equipment available, (3) products to be processed, (4) previous experience in using canning equipment, (5) area from which patrons come, (6) time best suited to them, and (7) number to be trained. A seasonal sequence of instruction should be followed in all phases of this training. The training program will be effective when taught just prior to or in connection with activities carried on by the groups or individuals.

In order to carry out this educational program, it will be necessary to use the existing educational agencies or other services available in the community. It will be one of the responsibilities of the local advisory committee to designate qualified persons to serve as instructors for the training program especially as it pertains to planning, producing, and conserving food. An educational program of this kind has been taught successfully in local communities by teachers of vocational agriculture and home economics, county Extension agents, county Farm Security supervisors, garden club leaders, and other interested individuals and groups. Experience has shown that greater quantities of more desirable food will be conserved by each family if it is given systematic instruction and training on planning the food needs, producing food, and food processing practices. As a result of this program the supervisor will have more definite information regarding the number of patrons planning to use the cannery and the amount of produce that will be processed in the cannery during the season.

PLANNING FOOD FOR THE FAMILY

A family should make a food budget in order to get the greatest benefit from the community cannery. This is done by listing the kinds and quantities of food that will be needed by the family during the year. The food budget includes foods that are produced in Victory or family gardens or that are purchased from local markets or producers. The quantity of fruit and vegetables planned should include foods to be eaten fresh as well as those to be conserved by storing fresh or by canning, freezing, brining, and dehydrating for later use.

NUTRITIONAL REQUIREMENTS OF THE FAMILY

To meet the nutritional requirements of the family, the food budget should be based on the Basic 7 Food groups as outlined in the pamphlet, Family Food Plans for Good Nutrition, issued by the Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture. The family food plan, at moderate cost, taken from this pamphlet, can serve as a basis for determining foods needed to meet the nutritional requirements of the average family on a weekly, monthly, and yearly basis. (See table 5 on page 38)

QUANTITY OF EACH FOOD TO BE CANNED

The quantity of food preserved by canning would depend on other methods of preservation available and on the length of the season when canned foods, rather than fresh products, are to be used. Food preservation budgets such as that shown in table 6 on page 40, set up by the Missouri Agricultural Extension Service, are available in most States and may be used as a pattern in determining the amount and variety of food to be preserved by any one family.

Although this budget is made for rural families it may be adapted to the use of urban families. When setting up an individual family budget it is important to keep in mind the variation of produce even within a State and to have the budget include foods that are available on the markets as well as those that may be produced. Families should be taught to make individual food budgets that are adapted to their own needs.

FOOD PRODUCTION POSSIBILITIES

In making out the family food budget the foods that can be produced at home will need to be considered. One large planting for canning will save time and transportation for patrons. Plantings for canning purposes should be made at the season most favorable for producing those fruits and vegetables adapted

Table 5 - Family food plan at moderate cost

Family members	Kinds and quantities of food for a week										
	Milk 1/	Potatoes, sweet-potatoes	Dry beans and peas, nuts	Citrus fruit, tomatoes	Green, yellow vegetables	Other vegetables and fruit	Eggs	Meat, poultry, fish	Flour, cereals 2/	Fats and oils	Sugar, sirups, preserves
	Qt.	Lb. Oz.	Lb. Oz.	Lb. Oz.	Lb. Oz.	Lb. Oz.	No.	Lb. Oz.	Lb. Oz.	Lb. Oz.	Lb. Oz.
Children under 12 years:											
9-12 months...	7	0 - 8	- -	2 - 0	1 - 8	0 - 8	5	0 - 2	0 - 8	0 - 1	0 - 1
1-3 years.....	5	1 - 0	- -	1 - 12	1 - 8	1 - 0	5	0 - 8	1 - 8	0 - 4	0 - 2
4-6 years.....	5	1 - 8	0 - 2	1 - 8	1 - 8	1 - 8	5	1 - 0	2 - 0	0 - 6	0 - 8
7-9 years.....	5	2 - 8	0 - 2	1 - 8	1 - 8	2 - 8	5	1 - 8	2 - 8	0 - 10	0 - 8
10-12 years...	6	3 - 0	0 - 2	1 - 8	1 - 8	2 - 8	5	2 - 0	3 - 4	0 - 12	0 - 10
Girls:											
13-15 years...	6	3 - 8	0 - 4	1 - 12	1 - 8	2 - 8	5	2 - 0	4 - 0	0 - 14	0 - 10
16-20 years...	5	3 - 0	0 - 4	1 - 12	1 - 8	2 - 8	5	2 - 0	3 - 8	0 - 12	0 - 10
Women:											
Moderately active......	4½	3 - 0	0 - 6	1 - 8	1 - 8	2 - 8	4	2 - 0	3 - 8	0 - 12	0 - 12
Very active...	5½	4 - 0	0 - 12	1 - 8	1 - 8	2 - 8	4	2 - 0	4 - 12	1 - 0	0 - 12
Sedentary.....	4½	2 - 0	0 - 4	1 - 8	1 - 8	2 - 8	4	2 - 0	2 - 8	0 - 12	0 - 12
Pregnant......	7	2 - 0	0 - 6	2 - 0	2 - 0	2 - 8	6	2 - 5	3 - 0	0 - 12	0 - 10
Nursing.......	10½	4 - 0	0 - 6	3 - 0	3 - 0	3 - 8	6	2 - 5	3 - 0	0 - 12	0 - 10
Boys:											
13-15 years....	6	4 - 0	0 - 8	1 - 12	2 - 0	3 - 0	5	2 - 0	5 - 0	1 - 2	0 - 12
16-20 years....	6	5 - 0	0 - 12	1 - 12	2 - 0	3 - 0	5	2 - 0	7 - 0	1 - 6	0 - 12
Men:											
Moderately active......	5	4 - 0	0 - 12	1 - 8	1 - 8	2 - 8	4	2 - 0	4 - 12	1 - 0	0 - 12
Very active...	6	7 - 0	1 - 0	1 - 8	1 - 8	2 - 8	4	2 - 0	9 - 0	1 - 10	0 - 12
Sedentary.....	5	3 - 0	0 - 6	1 - 8	1 - 8	2 - 8	4	2 - 0	3 - 8	0 - 12	0 - 12

1/ Or its equivalent in cheese, evaporated milk, or dry milk.

2/ Count 1½ pounds of bread as 1 pound of flour.

to any given area. This will not be as difficult for those people living on farms as for the urban dweller who will have to decide which products to plant in order to get the most value from the available garden space.

After the food budget for the family has been decided on, systematic instruction and study should be undertaken with respect to: (1) Determining size of garden, (2) selecting site for garden, (3) determining amount of seed needed, (4) selecting and obtaining kinds and amounts of fertilizers, and (5) other activities which are needed in connection with planning for the family food supply.

PRODUCING FOOD FOR FAMILY USE

Where families have their own gardens several group meetings should be held just before and during the growing season to study the methods used by successful growers in the community and the recommendations of local experiment stations. These studies include: (1) Preparing the seed bed, (2) selecting varieties best adapted to the local area and for canning, (3) succession planting of crops to avoid overcrowding of the cannery, (4) starting plants in hotbeds or cold frames, (5) pruning, (6) spraying, (7) cultivating, and (8) harvesting.

Prior to the time when the fruits or vegetables are ready to be harvested or purchased for canning, a few group meetings should be held to discuss such problems as: (1) The stage of maturity of the products that will insure a high-quality finished product, (2) the proper type of containers for harvesting and transporting products to the cannery, (3) the quantity of products to be harvested for processing during any 1 day, (4) time of day best suited for harvesting, (5) holding certain products for processing by using temporary storage, and (6) preparatory steps to be taken before the products are brought to the cannery.

This systematic instruction on providing the family food should be supplemented by posters, postal card folders, news articles, circular letters, or other devices that will inform the patrons of planning, producing, and processing activities.

In order for the supervisor to plan the work in the cannery, it is necessary to know in advance approximately how much and what kind of produce will be brought to the cannery and processed on any given day. To accomplish this purpose the instructor should train the patrons to make an appointment with the supervisor of the cannery for a canning date.

INSTRUCTING FAMILIES IN CANNING PRACTICES

Specific instructions should be given the patrons on the preparation practices and canning techniques to be followed in the various steps of the canning operation. The individuals responsible for the training program may be able to obtain the services of experienced patrons or volunteer workers to assist in the training of inexperienced patrons in the preparation of products and the techniques of canning food. Instruction also must be given on the operation and use of equipment.

The use of trained employees to operate, maintain, and adjust the intricate pieces of canning equipment such as boilers and retorts will (1) increase the

Table 6. - Family food-preservation budget

Product	Amount to can 1/		Product	Amount to store, dry, brine, and cure	
	For 1 person	For family		For 1 person	For family
Tomatoes and tomato juice	30 qt.	-	Potatoes	3 bu.	-
Green and yellow vegetables:	20 qt.	-	2-3 bu. (Irish)	-	-
5-7 qts. greens:	-	-	1 bu. sweetpotatoes	-	-
Wild greens	-	-	Cabbage and Chinese cabbage	1 bu.	-
Spinach	-	-	(about 10 heads)		
Mustard	-	-	Yellow vegetables	-	-
Chard	-	-	½ bu. carrots	-	-
Turnip greens, etc	-	-	½ bu. Hubbard squash	-	-
10-15 qt. other green			Sweetpotatoes	-	-
vegetables:	-	-	(as above)		
Young green beans	-	-	Other vegetables and fruit:	4 bu.	-
Peas	-	-	1-3 bu. vegetables:	-	-
Asparagus, green	-	-	Turnips	-	-
1-2 qt. yellow vegetables:	-	-	Beets	-	-
Carrots	-	-	Onions	-	-
Sweetpotatoes	-	-	Parsnips	-	-
Other vegetables and fruit:	50 qt.	-	Salsify	-	-
10-20 qt. of vegetables:	-	-	Rutabagas	-	-
Vegetable soup mixture	-	-	Squash and pumpkin	-	-
Mature green beans	-	-	1-3 bu. fruits:	-	-
Baby beets	-	-	Apples	-	-
Corn	-	-	Pears	-	-
Sauerkraut	-	-	Dried vegetables and fruits:	4 gal.	-
30-40 qt. fruits:	-	-	2-3 gal. vegetables:	-	-
Apples	-	-	Corn, beans, peas, soybeans	-	-
Peaches	-	-	1-2 gal. fruits:	-	-
Pears	-	-	Apples, peaches, pears	-	-
Rhubarb	-	-	Meats	-	-
Plums	-	-	Cured pork	20 lb.	-
Grapes	-	-	Cured bacon	10 lb.	-
Cherries	-	-	Lard	1 gal.	-
Berries	-	-	Sorghum and honey	2 gal.	-
Apricots	-	-	Sauerkraut	1 gal.	-
Apple, peach, pear,			(cabbage and turnip)		
rhubarb, plum, grape,			Nuts (in shell) peanuts,		
cherry and berry juices	-	-	hickory, walnuts, hazel,		
8-12 pts. pickles, relish,			pecans	1 bu.	-
catsup, etc	5 qt.	-	Whole wheat for cereal		
8-12 pt. jams, jellies,	-	-	and other dishes	1 gal.	-
preserves, etc	-	-	Popcorn, on cob	2 gal.	-
Meat					
8-12 pt. pork	-	-			
8-22 pt. beef	-	-			
8-12 pt. chicken					
and other meats	-	-			

1/ If a freezer locker is used, reduce the number of quarts canned according to the amount placed in the locker.

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amount of food processed, (2) aid in more efficient operation of the plant, and (3) insure a high-quality canned product. The supervisor of the community canning plant will need to train employees or other persons to operate the equipment.

If the person responsible for the training program has had teaching experience that includes job analysis, little difficulty should be experienced in training the employees and patrons in canning procedures and operations.

In order that the instructor may make a job analysis it will be necessary to decide first, what specific job is to be taught. No attempt is made to teach all the activities that take place in the operation of a cannery at one time. Instead, it is considered desirable to teach a person only one operation at a time.

The instructor should list all the important steps in the order in which they must be done. Each step listed should be accurate, brief, and clear. It is important that this be done because, quite often, the instructor may know how to do the job so well that he does some step automatically and may not teach that step to the learner.

The instructor should list the key points in each step. A key point is anything in a step that might make or ruin the job, injure the worker, or make the work easier to do. The key points to be listed are the techniques which are to be emphasized at each step of the operation if a thorough job of instruction is to be accomplished.

Before using the teaching plan with individuals or groups, the instructor should do the job according to the plan developed and check to see that all steps and key points have been included.

A break-down of all jobs connected with the preparation and processing of the product and the operation of each piece of equipment should be outlined and training given the individuals who are to do these jobs.

The telling or lecture method of teaching gives individuals information about a canning technique but does not train the individual to acquire skill in performing the task. Similarly, a demonstration without explanation will show the individual how to perform a task but does not give information about the job or practical experience in performing it skillfully. The teacher who uses a combination of both methods of instruction plus the technique of having the patron "learn through doing" will carry on the most effective training program. In using this procedure the instructor should outline the important steps in doing each job and the essential points to observe in performing each step. The correct equipment and all necessary materials and supplies should be available and correctly arranged for doing the job to be taught. The following procedure has been found effective in training inexperienced persons to do canning.

Step 1. - The instructor should state clearly the specific job to be done and stress the importance of performing each operation correctly. Persons having previous canning experience may demonstrate their skill and if proficient, proceed with the work.

Step 2. - The instructor should explain and demonstrate the job in clearly defined steps, stressing the points which will result in success or failure. Charts, pictures, films, and other illustrations may be used to emphasize these points. It may be necessary to explain and demonstrate some steps several times in order to teach clearly the skills to individuals.

Step 3. - Each trainee should do the job under close supervision, the instructor attempting to prevent errors. It is a good practice to have the trainee point out the essential steps he has performed in doing the job. Questions may be raised as to what, how, and why he has carried out each operation. Have each trainee repeat the job under supervision until he understands and can perform each operation.

Step 4. - The training will be more effective if the person does the job immediately in connection with processing his own products or operating the piece of equipment to which he has been assigned. If certain points are not clear, questions should be encouraged to clear up these points. At first the instructor should check frequently the work being done. Less supervision will be required as the person acquires skill. The instructor should designate some person to assist in giving information to patrons on canning operations or in operating canning equipment.

BEFORE PLANT OPERATIONS BEGIN

PATRON'S AGREEMENT

An agreement outlining policies and regulations that have been adopted by the cannery committee is usually presented to patrons the first time they come to the cannery. Before operations begin, patrons are required to sign this agreement indicating that they fully understand its terms and are willing to comply.

Such an agreement might include the following:

1. The standards of operation and techniques of canning adopted by the center.
2. Divisions of labor; namely, the work the patron will do at the cannery and what services the cannery will supply.
3. Cost per can the patron will be expected to pay.
4. A list of materials and supplies to be furnished by the cannery and those the patron must furnish.
5. A statement of plant policy on spoilage of products.
6. Regulations on registration and scheduling.
7. Rules on cancelation of appointments, either by patron or by cannery supervisor.
8. The types of produce that may be canned.

PERSONNEL: EMPLOYED AND VOLUNTEER

In getting ready for plant operation the supervisor and committee must decide upon the number of employees needed to operate the plant and how they will be selected. In a community cannery, patrons usually prepare their own produce, fill it into the cans, and mark the cans. Patrons also assume responsibility for cleaning the equipment and space they have used in preparing their products, and for disposing of any refuse from their products. In small canneries it may be necessary for patrons to assume other jobs, but in most instances it is best to employ personnel for the key jobs, such as operating the boiler, retorts, and sealer.

The boiler operator should give full attention to boiler operation. He should be an experienced operator and in some States must be licensed. In addition to the care and operation of the boiler, he is usually responsible for the maintenance of the steam lines in a plant. He should not be required, however, to do other tasks that will take him away from the boiler for any period of time.

During processing periods one person will need to spend full time at the retorts. Other jobs that can be performed near the retorts include loading of filled cans into the retort baskets, and cooling and unloading of processed cans.

The sealer operator should be trained to test can seams and make the necessary sealer adjustments. Like all other employees he should be responsible for the daily upkeep and care of the equipment which he operates.

In large plants it is usually advisable to employ a foreman to assist the supervisor in receiving produce, training patrons, and in supervising the general work of the plant. Such a person will need to be as capable and well trained as the supervisor in operating the cannery and in teaching or directing others.

Other employees might include: A clerk, who is responsible for making appointments, maintaining records, receiving money from patrons, and releasing canned goods; a janitor for general cleaning and refuse removal; an additional key employee who can be trained to replace anyone in the plant. Such an employee could relieve the retort operator and sealer operator during rest and lunch periods, or replace either one in case of absence so that plant operations will not need to be curtailed in their absence. Other jobs that might be assumed by this person would include making brine and sirup and issuing cans to patrons.

Some communities have found it advantageous to use volunteer workers in their canning center. Such workers usually assume the responsibility of instructing patrons in the preparation of their produce. Volunteer workers should not operate boilers, sealers, retorts, or other pressure equipment unless they are fully qualified to do so. When such workers are so used it is important to select those who can be depended on for a definite period of time.

PROTECTION FOR EMPLOYEES AND PATRONS

It is always wise in a community venture such as a canning center to insure employees and patrons against accidents that may occur.

Many canneries carry Workman's Compensation Insurance for employees which pays their wages in case of disability. Some also carry a public liability policy and a boiler insurance policy for protection of patrons as well as employees in case of personal injury due to an accident at the cannery. The latter policy usually covers damage to property as well as personal injury.

If a cannery is operated under the supervision of a school which is so insured, the cannery usually can be included in the policy at a saving in the premium that would be charged for one carried independently.

GETTING INFORMATION TO THE PUBLIC

Newspapers, local merchants, and radio stations can give valuable help in publicizing the community cannery and its program if information is made available to them by the committee and the supervisor. To be effective, this information should follow a general pattern commencing with the organization of the cannery. Throughout the canning season some member of the committee should be responsible for compiling and releasing pertinent information. This should include photographs, radio interviews, and other news material.

Newspapers and radio stations should be sent copies of agreements between the cannery and patrons, advance information on when the cannery will open, when and where people may make appointments for using its facilities, and what produce will be canned. They also should be given names of the committee members and their functions.

Gas and electric light companies may be willing to cooperate with the program to the extent of mailing informational circulars along with the monthly bills.

If certain days are set aside for canning a particular product the notice should appear in advance in the newspapers. This allows patrons time to make their appointments with the cannery. Local stores that carry produce for canning may be induced to include notices of canning dates in their regular advertisements.

Items of public interest such as outstanding accomplishments of the cannery should be reported both to radio stations and newspapers as they occur. Newspapers may also be interested in well-illustrated articles on the cannery operation for use in their Sunday issues.

OPERATING THE PLANT

OPERATION, CARE, AND MAINTENANCE OF EQUIPMENT

This section is not intended to be a complete treatise on operating, care, and maintenance of all equipment used in a cannery but rather to point out some of the principles that apply to the major equipment, including the boiler, retorts, open-process kettles, exhaust boxes, and the sealer. The responsibility for the care and maintenance of canning equipment and the general upkeep of the plant usually is assumed by employees.

The Boiler

Becuase boilers are so varied in type, it is impossible to give specific directions on the operation of all kinds of boilers that will be used in a community cannery. However, the general principles that will serve the operation requirements for all boilers are as follows:

The first duty of a fireman in preparing to fire a boiler is to check the water level. This is accomplished by two methods: (1) Ascertaining the level of the water as shown on the sight glass and checking to see if the sight glass is functioning properly. To do this, close both sight glass valves and drain the sight glass. The valves should then be reopened to see that the water returns to the same level as shown before. (2) Open and close all three try cocks to determine whether the sight glass shows the correct level. The water should flow only from the center and bottom cocks as the proper level should be half-way between the center and top try cocks.

It should next be determined that all valves in the boiler room are in proper position for operation. The main steam supply or header valve should be closed and valves on the water-feed system should be either opened or closed in accordance with instructions for the particular type of water feed system used.

When starting the fire the draft door and stack damper should be opened; the grates should be in the proper position for firing and free from clinkers. Ashes should be scattered to a depth of 1 inch over the entire grate area before the fire is kindled. In the case of a new boiler installation, especially where it is bricked in, caution should be used that the heat is not brought up too fast. Time should be given to allow the boiler to heat and expand slowly. In no case should a boiler be forced to reach the required pressure too rapidly. After the fire has started and while waiting for the boiler to warm up, steam valves on all equipment in the plant should be closed.

At this point, the seams, rivets, connections, and fittings should be checked to see that there are no leaks. No defects should be assumed to be safe. When the boiler reaches one-half the normal operating pressure it should be blown down and the safety valve tried by hand to see that it is functioning properly. The purpose of blowing down the boiler is to remove the accumulated sediment around the base of the tubes and at the bottom of the water pit. This is accomplished by very slowly opening the blow-down valve located at the bottom of the boiler to a fully open position until the water level in the sight glass is lowered by one-half. The blow-down valve is then closed and the water replenished in the boiler to a normal operating position. When the boiler reaches the normal operating pressure the fireman should notify the supervisor that he is ready to turn the steam into the supply lines. It is important for the supervisor to see that no one is repairing steam lines at this time and that patrons and employees are warned that the steam is being turned into the lines.

The main steam supply valve should be opened very slowly at first, a little time being allowed for the lines in the plant to warm up before opening it widely. This will prevent undue strain on the lines and fittings.

The supervisor should acquaint the fireman with the steam needs for various products and processes so that the fireman will know when extra demands will be made for steam. A more satisfactory ooeration will result if the fireman is able to build up the steam supply before the demand actually occurs. Fire is maintained in a boiler by adding the fuel in small amounts at a time and at frequent intervals. This results in more complete combustion and a quicker response to peak loads of steam when required.

It is good operating practice at some time during each day's operation to build up the steam sufficiently to check the operation of the safety valve at the pressure for which it has been set. As the safety valve opens, the number of pounds of pressure on the steam gage should be noted and should check with the pressure at which the valve was set.

The water level in the boiler should be watched carefully and the water feed system started to operate well in advance of the actual demand for water. This gives the operator some leeway in case difficulty is encountered in operating the water feed system. If for any reason the gage shows that the water has fallen to or below the point designated by the manufacturer as a minimum operating level, no attempt should be made to feed water into the boiler. All valves should be left as they are and the fire withdrawn from the grates. The fire door should be left open so that the draft created through the tubes will cool the boiler to a point where it is safe to replenish the water supply. If the gage glass is not equipped with chain-operated, quick-closing valves, it is recommended that a common broom be kept near the boiler at all times. In case of a broken glass the broom may be used to prevent scalds in shutting off the sight glass valves. It should be pushed over the valve stem, the broken glass, and the valve head so that the straws will break the force of the escaping steam and water and give the operator a chance to close the valves without being scalded. The bottom valve should be turned off first; the top valve closed last. With the steam and water shut off, the glass may be replaced.

Owing to the fact that excess oil, gas, compounds, and lime sediment may have accumulated in the boiler, a condition called foaming and priming may occur sometimes. This is indicated by the presence of foam and the rapid rise and fall of the water level in the sight glass. If the water level is high enough, the boiler may be blown down and the water supply replenished. By repeating this process several times the condition may be corrected. In extreme cases, however, it may be necessary to wash down the boiler. The job of washing down the boiler should be done when the boiler is cold. It will be necessary to remove all handhole and manhole plates and start at the top of the boiler, washing inside with a hose. In this manner the sediment is washed down to the lowest point from which it is possible to remove it from the boiler. Before replacing handhole and manhole plates, the gaskets and surfaces which they contact should be examined to see that they are clean and smooth. The gaskets should be painted with a mixture of graphite and oil to keep them soft and pliable. The necessity for washing down will vary according to the frequency of use and the local water supply but the job should be done often enough so that at no time there will be an excessive accumulation of sediment for the type of boiler used.

An accumulation of soot in the tubes of a boiler reduces the efficiency because it acts as an insulation. It should be removed, therefore, as often as necessary to permit direct contact of the heat with the tubes. This is usually accomplished by drawing a scraper or wire brush back and forth through the tubes to dislodge the deposits. The frequency of this condition and the need for cleaning will vary with the type and quality of fuel used and the frequency with which the boiler is used. The boiler tubes should be blown out daily with steam.

This usually is done in the morning before operation begins, or it may be done when there is a lull in operation during the day.

The ashpit should be kept free at all times of all accumulation of ashes and clinkers as such an accumulation reduces the draft and builds up the heat on the grates.

In some localities where the water supply is such that boiler compounds must be used, extreme care should be exercised in their use if an open steam system is installed. This is important because the steam comes in direct contact with the food and picks up some of the alkali, which is usually the base of boiler compounds. The alkali softens or changes the texture of the food. Some boiler compounds when absorbed by the food may cause gastric disturbance. If boiler compounds must be used, the closed steam system is preferable.

> Caution:
>
> The safety valve should be set by a qualified boiler inspector at the time the boiler is installed and should never be changed except on the advice of a boiler inspector. The safety valve should be kept free at all times and properly lubricated. The pipe from the blow-down valve should lead to a sump or pit, or a baffle should be placed opposite the end to prevent anyone's being scalded. If the boiler grates are equipped with a detachable shaker bar, it should be kept in place or hanging in a convenient place near the boiler at all times because its use may be necessary in withdrawing the fire in case of an emergency such as loss of water in the boiler.
>
> The boiler room should be kept clean and in order at all times and no tools or obstruction should be permitted to remain on the floor or at a point that would hamper the operation of the boiler system. Boiler room doors should open outward and should never be bolted. Boiler rooms should be properly ventilated to prevent an accumulation of gases. Persons not immediately concerned with the operation of the boiler should never be permitted in the boiler room. The boiler should be attended and operated in accordance with State and local codes.

Retorts and Pressure Cookers

The method of operating retorts and pressure cookers varies necessarily with the method of heating, the most common of which is by steam or gas burners. In any retort or pressure cooker the medium of temperature is steam. Retorts as referred to in this publication are pressure vessels heated by a direct steam line from the boiler, whereas pressure cookers include any pressure vessel in which steam is produced by heating water within the vessel. Approximately 4 inches of water is used in a gas-fired No. 2 retort (the largest vessel that can be used successfully as a pressure cooker) and a proportionate amount is used in the smaller pressure cookers, to supply the steam necessary for processing. The steam condenses as it comes in contact with the cans and the inside surfaces of the vessel and, as this occurs, considerable heat is transferred to the cans. This condensation, as it forms, returns to the bottom of the pressure cooker to replenish the water supply and thus assures a constant supply of water and steam.

Since the pressure gage or thermometer on a retort or pressure cooker may get out of order and fail to register accurately, it is extremely important that it be checked with a master pressure gage and thermometer at the beginning of the canning season and as often as necessary during the period the retort or pressure cooker is in use. This may be done by removing the retort gage and replacing it with the testing equipment as shown in figure 18. (Greater accuracy may be expected when all gages are checked against the master gage at the same time than when only two gages are compared.) The retort is then brought up gradually to operating temperature and the readings of the instruments compared.

A maximum thermometer of a temperature range of 100° to 300° F. also may be used to check the accuracy of pressure gages. This is done by placing the maximum thermometer in the retort in an upright position after preparing the vessel as for processing and running the pressure up to 10 pounds for at least 5 minutes. The thermometer should read 240° F., allowance being made for a possible error of 1° at this pressure. For further check, repeat this procedure but run the pressure up to 15 pounds for 5 minutes and observe the temperature reading. At this point it should register 250° F., allowance being made for a possible error of 2°.

When master gages are used to check retort and pressure-cooker gages they also will need to be checked for accuracy. This may be done at the State agricultural college or at a railroad shop where a monometer may be available. Before using a retort or pressure cooker the safety valve also will need to be checked to make sure it is functioning at the pressure for which it has been set.

In using a retort for the first time the position of the cover in relation to the body should be marked and the cover replaced every time in the same position. This will prevent damage to the gasket and avoid possibility of leaks from that source. Pressure cookers are usually marked with an arrow to indicate the position of the lid. The lid should be clamped securely into position but without use of too much force, since this will cause unnecessary wear on the threads of the wing bolts. It is necessary to fasten the lid only securely enough to prevent escape of steam between the lid and retort.

A point to be remembered with respect to all retorts and pressure cookers, regardless of make, size, or method of heating, is that they must be "vented" during the "coming up" time to eliminate any possibility of air being trapped within the vessel. Where retorts are not equipped with thermometers the temperature is computed on the basis of the pressure within the retort; it is important, therefore, that the pressure shown on the gage be steam pressure and not air pressure since the latter would result in an incorrect temperature for the required process. The reason for this is that most of the heating effect of steam is the result of condensation and when air is present it acts as an insulator preventing steam from condensing on the cans. Since the processes for canned food are determined on cans heated in an atmosphere of steam free from air it is essential that all air be removed from the retort before timing of the process is begun. Air may remain among the cans in the form of pockets which are hard to remove and which may persist for a considerable period of time. (See Stacking Cans on page 67.) As a result, cans in such pockets may be underprocessed because the temperature in the air pocket may be considerably lower than that shown by the retort gage or thermometer. Because these air pockets are not indicated by the pressure gage or retort thermometer it is important that all retorts be vented for predetermined times. Retorts equipped with thermometers should have the thermometer pocket vented to insure a correct reading.

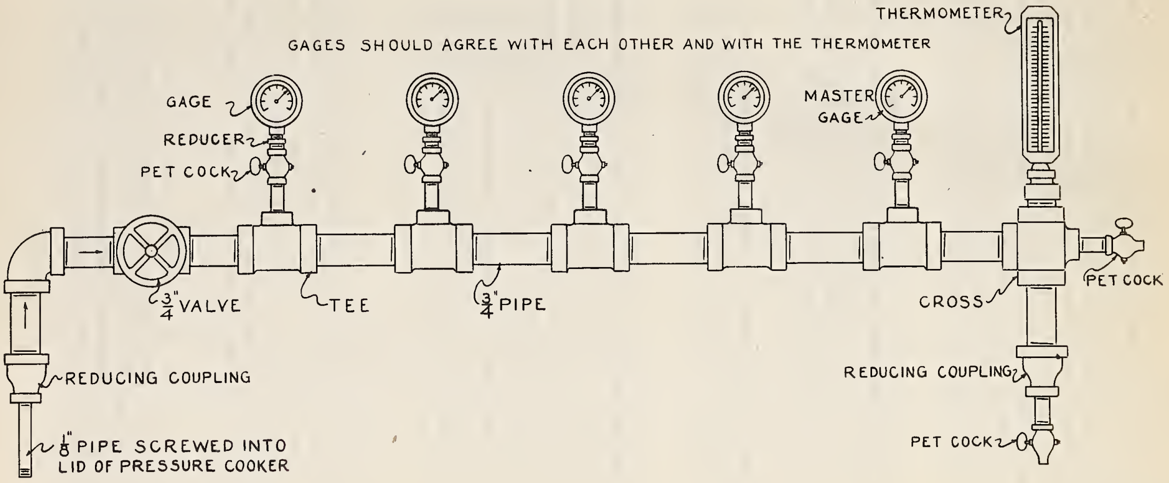

Figure 18.--Method of testing pressure gages.

Without venting, the thermometer pocket might contain a quantity of trapped air which would reflect a false reading.

When a retort is supplied with steam from a boiler system, the "vent" or pet cock on top of the retort remains 1/2-turn open throughout the entire processing period. However, it is common practice on retorts and pressure cookers which are heated by a fuel-fired heating unit to close the vent on the cover during the processing period in order to conserve the water supply within the vessel. In the latter case, the pet cock is not closed until the retort is well vented and a flow of live steam is coming from the vent. Such a flow of steam should be allowed for 10 minutes before the pet cock is adjusted for processing. Partially filled retorts will require a longer period for venting than retorts that are fully loaded.

In either case, it is important that timing for the process is not begun until the required pressure and temperature reading are reached. At this point the time at which the process will be completed should be computed and recorded on the retort or a clock face or pad. A small square marked off on the retort with blackboard paint makes a very satisfactory place to record processing periods. Chalk may be used and erased with each processing.

It is very important that the pressure or temperature should not be allowed to fluctuate or fall below the required processing temperature if the full value of the process is to be realized. This fluctuation also causes undue strain on the cans.

At the end of the processing period, the steam supply line to the retort should be closed, and the retort should be left to vent until the pressure is zero before its cover is removed. Too rapid venting at the end of the processing period may cause cans to buckle. The pet cock should be opened gradually as the pressure goes down. A retort or pressure cooker heated by direct heat should be removed from the source of heat and vented as rapidly as the consistency of the product will permit and until the pressure is zero. Products that have a slow rate of heat penetration and require a long processing period ordinarily need to be vented slowly to prevent the forming of pressure buckles. When the pressure is zero the cover may be removed from the retort and the basket of cans taken out for cooling.

Some Important Points for the Retort Operator

The total operating time required for processing in a retort or pressure cooker may be kept to a minimum and the time for heating up to the required pressure can be reduced if the retort or cooker and cover are heated before the basket of cans is placed in the retort. It is important that a cooker never be left over fire without water in it. The lid of a retort or cooker must never be removed before the pressure is zero and after the pet cock has been opened to allow all pressure to escape.

Retorts and pressure cookers must have proper care if they are to last and be usable for an indefinite period. They should be flushed with water and steam after each day's use and left open to ventilate. The safety valve and pet cock should be cleaned and checked as frequently as necessary. Gaskets on retort lids must be kept clean. Once each week use graphite oil on asbestos gaskets to keep them from getting brittle.

Open-process Tanks

Open-process tanks should be filled with sufficient water to cover the cans. It is important that the water be near the boiling point or 212° F. when the cans to be processed are added, as this shortens the time required to bring the water back to 212° F. Timing of the water-bath process is not begun until the temperature has reached the boiling point. In using steam-heated process tanks, care must be taken not to mistake the agitation caused by the steam for the actual boiling of water. The processing time should be computed and recorded as soon as the processing temperature is reached. The water must be kept at 212° F. throughout the processing period as any drop in temperature will cause the processing time given in this publication to be insufficient.

Cooling Tanks

As the basket of cans is removed from the retort, pressure cooker, or open-process tank, it is placed in the cooling tank if the product is to be water-cooled. It may be desirable to place products that have a slow rate of heat penetration at the overflow end of the cooling tank and then move the crate to the cooler water to prevent formation of pressure buckles from too sudden change of temperature. Cold water is admitted to the cooling tank only as necessary to carry away the heated water and keep a continuous circulation of cool water among the cans. Any nonacid product canned in larger than No. 3 cans should be cooled under pressure.

Exhaust Boxes

The exhaust temperature required for different products will control more or less the period of time required to complete the exhausting. The speed of exhausting, however, also varies with the product. It is necessary to exhaust some products slowly to preserve the texture and color of the product. Other products may be exhausted more rapidly. A continuous-type exhaust box operated with a motor usually has at least three different speeds at which it can be operated. Products requiring a slow exhaust are put through the box on low speed. The amount of steam turned into the box should vary with the rate of exhausting and the temperature required for the product. The amount of steam and speed best to use can be determined by checking the product frequently with a thermometer and adjusting the speed and steam according to the results desired.

In batch-type exhaust boxes where water is used for exhausting, care must be taken to keep the water from boiling so vigorously that water is splashed into filled cans. Water should come to within 2 inches of the top of the cans.

When products are exhausted with steam in a batch-type exhaust box, the amount of steam used will vary with the speed at which the product is exhausted. As products are placed in the batch-type exhaust box the cover should be replaced to prevent undue loss of temperature. Products should be checked with a thermometer for the temperature required before they are removed for sealing.

Exhaust boxes must be flushed and cleaned daily and the covers removed and left open each night so that the box may be thoroughly aired before beginning the next day's run. Both types of exhaust boxes should be drained daily and, in the case of continuous boxes, all moving parts should be kept well lubricated.

Sealers

The operation of a sealer will vary considerably according to the model and type used. Sealers should be operated in accordance with the manufacturer's instructions, consideration being given to the following information:

Sealers need to be checked for proper sealing before the day's run is begun and at frequent intervals during the day. The "wire test," often used for checking small hand-operated or electric sealers, is not an adequate test for good sealing of cans. The "file method of testing" has been found to be a satisfactory method of checking a can seam. (See figure 16.) It is extremely important to be able to recognize a perfect seal and to understand the function of the parts of a sealer to determine the adjustments necessary. In all makes or models of sealers, the principle is that two or more seaming rolls travel around the circumference of the can cover to form a seam and to roll it down smoothly to complete the double seam. This may be accomplished in one of two ways. In some machines the can rotates and the seaming rolls do not travel. Other machines may work upon the principle of the stationary can with the seaming rolls revolving around the cover. By both methods, however, the parts involved in the operation are analogous and have the same relation to each other and to the can.

The parts involved in forming and rolling a double seam are as follows:

The chuck is machined to fit snugly into the recessed cover or countersink of the can and serves the dual purpose of steadying the can and acting as an anvil against which the seam is formed. In some machines the chuck is slightly knurled for traction which enables it to rotate the can.

The seaming rolls are divided into two classes according to their purposes. The first operation roll has a groove which is semicircular and serves the purpose of turning the edge of the cover over the top flange of the can, thereby putting the cover hook and the can hook, as they are known, in proper position for sealing. The finished seam made by the first operation roll has a rounded contour. The second operation roll is very similar to the first in that it bears the same relationship to the chuck, and that it is activated by the same force which may be either manually or automatically controlled. Its purpose is to smooth down or flatten the loosely formed layers of tin plate of the rounded seam made by the first operation roll. For this purpose the seaming groove in the second operation roll is slightly flattened as compared with the groove in the first operation roll.

The base plate is a base or platform on which the can is supported during the seaming operation. In most machines it is free running and has no effect on driving the can, its only purpose being to give the can the proper pressure when it is raised into position.

Since sealers ordinarily do their work under very adverse conditions, it is recommended that the utmost attention be given to their care, adjustment, and oiling. Sealers need to be cleaned thoroughly every day. It is extremely important that brine spilled on sealer parts is washed off as it will cause such parts to corrode and rust and will reduce the period of service that can be expected of a sealer. It is recommended that only experienced operators be allowed to adjust, repair, or check can sealers.

CARE OF IDLE EQUIPMENT

During the periods equipment is not in use it should be given special care to prevent rusting and corroding. The boiler should be thoroughly flushed out and refilled, and 1/2-gallon of lubricating oil added to the top of the water. When the boiler is then drained the oil will coat the inside surfaces and keep them from rusting.

Remove gages, pet cocks, and thermometers from retorts and steam pipes, wrap them in heavy paper, and label them carefully to indicate the part and location. Clean thoroughly such equipment as retorts, exhaust boxes, pressure cookers, and mechanical equipment; dry and treat all surfaces that will rust with a heavy grease such as that used on an automobile chassis. Parts of equipment that need to be removed should be wrapped and placed with the equipment. Carefully inspect equipment for wear and make note of needed repairs. Steam-jacketed kettles and blanching baskets made of noncorrosive material may be covered with heavy paper to protect them from dust when they have been thoroughly cleaned. Check sealers for repair and replacement, oil where needed, and grease the external parts to prevent rusting. It is well to store sealers in their original shipping box, keeping all attachments together in a small sack, labeled, and stored in the box with the sealer. Small equipment, such as peeling knives, sharpening tools, etc., also need to be thoroughly cleaned, wrapped in paper, and labeled before storing. Check belting and hose for wear and replacement and store in a cool dry place. Make an inventory of all equipment at the close of the season as well as at stated intervals during the operation period.

SANITATION

Throughout this publication emphasis has been placed on the high degree of sanitation necessary if good results in canning are to be realized. To accomplish this, equipment and utensils should be cleaned after each day's use. Such items as peelers, pulpers, grinders, and the exhaust box are left dismantled for airing and thorough cooling and should be flushed with cold water before they are used again. Even with such careful daily cleaning, it is advisable to treat all equipment that comes in contact with food with a germicidal compound as an additional precaution against contamination.

1. Scrub tables with hot water and, if possible, steam before using them.

2. Make provisions for the regular disposal of garbage. Wash and, if possible, steam all garbage cans every day. Leave them open until time for use again.

3. Scrub and dry floors at least once a day. Flushing floors during shut-down periods or at meal time is frequently necessary. A squeegee or broom is used for removing excess water from the floor.

4. Keep walls, woodwork, and windows clean. Keep screens free from dust. Window curtains are not used as they catch and scatter dust in the cannery.

5. Clean toilets and lavatories and treat daily with a disinfecting solution.

6. Provide sanitary drinking fountains or individual paper cups for employees and patrons.

7. Sprinkle the area around the cannery with oil or cover with calcium chloride to keep dust down.

8. It is desirable that employees wear clean uniforms each day. Uniforms or towels should not be laundered in the cannery.

SAFETY

In addition to the safety precautions pointed out under various sections in this publication, the following factors should also be considered of importance:

1. Have stairways and entries well lighted.

2. Equip platforms and stairs, upon which patrons pass or work, with handrails that are securely fastened at a height for convenient use.

3. Provide ladders used in the plant with pads or points to prevent their slipping.

4. Keep floors clean and free of excess water and accumulated debris.

5. Have stools, tables, and other wooden equipment of solid construction and free from rough edges or splinters.

6. Do not repair machinery while it is in operation.

7. Protect exposed gears, belts, sprockets, chains, shaftings, etc., with a secure guard to avoid the entangling of any clothing or object.

8. Protect and ground electrical equipment in accordance with existing codes. When pull-chain sockets are used they should be insulated.

9. Do not attempt to repair boiler lines or steam fittings while the steam system is under pressure since this may result in serious injury to persons or cause property damage.

10. Place fire extinguishers at convenient locations in the plant and check them regularly to see that they are properly charged.

11. Where gasoline stoves are used, place them in large, shallow boxes of sand. Keep additional sand in buckets or provide a foam-type extinguisher in event fire results from use of such stoves. Make no attempt to fill gasoline stoves while there are other stoves in operation or flames burning nearby. Such stoves should not be refueled inside the building.

12. Where gas or gasoline burners are used, provide a vent to the outside for each burner.

13. Check retort baskets, bails, and hoisting equipment at frequent intervals for defects.

14. Tilt the lid away from the operator as it is removed from a retort or pressure cooker to avoid burns from steam.

15. Teach patrons the proper method of handling tools.

16. Advise patrons and employees to wear low-heeled, comfortable shoes to avoid slipping on floors.

17. Keep first-aid cabinets well stocked at all times. Give training in first aid to employees.

18. Provide salt tablets during hot weather to prevent heat exhaustion.

19. Provide aprons, boots, and gloves of rubber or acid-resistant material to protect the worker where caustic alkali is used.

20. Provide gloves or hand tongs for both men and women for handling hot cans. Gloves should have loose-fitting wrists so they may be removed quickly in an emergency. Warn patrons and employees that constant use of gloves will make the hands tender and susceptible to infection.

APPOINTMENTS AND SCHEDULING

Patrons must make appointments with the supervisor for the use of the cannery if it is to operate with any degree of success. Such appointments should be made from 1 to 2 weeks in advance of the day canning is to be done, so that a plan of work may be set up and operating needs determined. It is desirable to record the patron's name, address, and telephone number, as well as the kind and amount of produce he is to bring. A standard form, such as the specimen suggested, may be used.

PATRON'S APPOINTMENT RECORD AND RECEIPT

(Month) (Day) (Year)

Time	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	1:00	1:30	2:00	2:30	3:00

Name________________________________ Patron's Number______________

Address_____________________________ Telephone Number_____________

Produce	Amount scheduled	Size of container	Amount delivered	Remarks

____
Supervisor

At the time the appointment is made patrons should be advised of the hour and day on which they are to report to the cannery.

The supervisor will need to know:

1. The approximate length of time required to prepare the produce. This will vary with the type of produce and the patron's ability or skill in preparation. A standard of preparation time for each type product may be established after the cannery has operated a short while.

2. How the patron prefers his produce prepared — such as corn, cream style, or whole grain; peaches, canned in medium or thin sirup; apricots, canned whole or halved and seeded. Such information has a definite bearing on the time to be scheduled for canning, the amount of labor required, and the supplies that will be needed. Supervisors must find out the size container patrons wish to use so that preparation may be scheduled to the best advantage.

3. Number of helpers the patron should bring to assist with the job. Unless the helper is a fast worker or the amount of produce to be prepared is limited, it is usually advisable to suggest two workers from a family. Such an arrangement not only expedites preparation but makes it possible for patrons to complete their canning more effectively.

4. Supplies such as sugar and salt that the patron will be required to bring. These should be of the quality recommended by the supervisor.

5. Stage of maturity and quality of products to be canned. No attempt should be made to process products of questionable quality.

Appointments must be made so that produce of like types may be grouped in the quantities and sequence necessary to insure a smooth flow of work and the maximum use of equipment. This will be particularly true during the peak of the season when as many patrons as possible must be accommodated so that produce will not be wasted.

A daily operating schedule similar to the one shown here should be made to record appointments at least 1 week in advance of the operating day.

DAILY OPERATING SCHEDULE

Month Day Year

Time	Patron's name	Patron's number	Produce	Amount	Size of cans

With such a schedule, the supervisor can more effectively regulate the amount and kind of produce to be canned as well as the number of patrons who will use the cannery within a given period. The schedule for the day is made up from the appointment record.

In order to get the equipment in use early in the day, the maximum number of patrons the cannery can accommodate at one time are usually scheduled for the first period. Smaller numbers of patrons may be scheduled for succeeding periods, the smallest group being scheduled for the last work period.

On a day of average production it is not advisable to schedule appointments later than 3 p.m. This will allow the time necessary to complete processing and cooling of products by closing time. During peak periods of production it may be necessary to schedule appointments over a longer operating day.

If equipment and preparation space do not permit the scheduling of acid and nonacid products for canning during the same period, nonacid products should be scheduled for canning during the early part of the day, as they require more time and space for preparation than acid products. Table 3, on page 35, which gives the approximate number of cans required for measured quantities of produce, will be helpful in figuring the number of cans to be processed.

The variety of produce canned in a community cannery should be kept to a minimum for any 1 day. During peak production periods, days set aside for only one item, such as corn, tomatoes, string beans, or fruit, will make it possible to handle larger quantities of produce in a minimum time. This is particularly true in urban areas where patrons may buy produce direct from the grower or market. In areas where the cannery must depend on the patron's garden as the main source of produce, it will be necessary to can several products each day. Where this is necessary, care should be taken not to schedule produce that will compete for the same equipment during the preparation period. Tomatoes can be scheduled to advantage for canning at the same time as a vegetable requiring considerable preparation, such as snap beans or peas, for they can be completed quickly by one patron while another is preparing the product that requires a longer time to prepare.

When scheduling vegetables and fruits, preference should be given to the more perishable ones. The harvest of root crops may easily be delayed if necessary so that perishable items, such as corn or peas at the right stage of maturity for canning, can be cared for promptly. Small fruits and berries need immediate care if waste from spoilage is to be avoided. When several kinds of produce are canned within a given day and the amount of any one kind is not sufficient to complete a retort load, those products requiring the same processing time and temperature should be scheduled together, if possible. In that way the full capacity of each retort can be used and the maximum production for each day assured.

A review of the schedule in advance of the canning operation makes it possible to adjust appointments if changes need to be made. Such an advance check will allow time also for making a plan of work so employees and volunteer workers can be informed of their responsibilities and given training as necessary. The supplies that need to be prepared should be determined in order to assure readiness for canning.

The number, size, and type of containers and corresponding lids needed should be ascertained and checked to see that they are on hand. All facilities also should be checked and equipment should be adjusted for operation. Such forethought will net improved efficiency in the day's operation.

Staggered lunch periods for regular employees should be planned to insure continuous operation of the plant throughout the day. Schedule one person to relieve, as necessary, those in key positions. Each employee should report to work as the day's schedule requires his services. The boiler operator, for example, should come early enough to have steam up when operations begin. The sealer and retort operator need not report until later. Others are scheduled according to their respective duties. Rest periods for each employee should be allowed both during the morning and afternoon.

CANNING PROCEDURE

RECEIVING PRODUCE

The supervisor should tell the patron at the time he makes an appointment for canning the amount of produce that can be handled satisfactorily for the day. Produce is checked in and recorded on the individual patron's appointment record when it is delivered to the cannery. An example of such a record is given on page 56. Make this record in duplicate so that the patron may be given a copy at the time the canned products are released. Comments as to the quality and condition of the produce at the time of delivery to the cannery should be noted as they may be of value if spoilage occurs. Appointment records supply the supervisor with information that can be used as a guide in determining what training patrons need in the harvesting and care of produce for canning.

If, at the time the produce is received, it fails to meet the standards set up by the committee for safe, wholesome food for canning, it should not be accepted. Unripe fruit or tomatoes, wilted vegetables, or products matured beyond the stage for successful canning should be rejected. Consideration should be given also to the fact that heating occurs when produce is held in an unventilated container for too long a period and that this often causes a slimy condition which makes the texture undesirable and may result in flat-sour spoilage. If a patron insists upon canning such produce he should sign an agreement to the effect that the cannery will not be held responsible for spoilage or for the quality of the finished product.

Accepted produce should be assigned to a temporary storage space that is cool and well ventilated. If yield records are to be kept in terms of food canned, the produce should be weighed. Only amounts that can be processed on the day received should be accepted. Since the most desirable product results from produce most recently harvested, handling should be as quick as possible.

Tag the hampers or containers of produce as soon as they are received with the owner's name or number. By means of this number a patron's produce can be identified from the time it enters the cannery until it is processed and released as a canned product. It should be recorded on the appointment sheet and daily operating schedule. In small communities where the number of patrons is limited, the same number may be used by the patron throughout the canning season.

PREPARATION OF PRODUCE

Preparation of the produce is usually assumed by the patron and includes all the steps necessary for getting the produce ready and placed into cans. Each patron is given space at the preparation table and instructions for preparing the particular product to be canned. The supervisor should explain the steps in preparation according to the sequence of operations, and advise the patron as to the approximate length of time that is required to complete the phase of work that is his responsibility. Sequence of operations in preparation of produce may be printed on charts and posted on the wall near the preparation tables.

Patrons should be cautioned of the necessity for cleanliness in handling food from the time it is harvested until it is completely processed and cooled. When the patron completes the canning of his produce, he must assume the responsibility of cleaning the preparation table, equipment, utensils, and tools he has used and of disposing of any refuse.

Grading

Grading for quality as practiced by commercial canners is not necessary in a community cannery. Produce should be graded for size only when it affects the uniformity of the canned produce. For instance, in steaming beets for canning, more uniform results are secured by steaming those of approximately the same size at one time. It is also desirable to grade for uniformity of size where heat penetration is a factor. For instance, some products, such as large beets and carrots, must be cut in smaller pieces of about the same size to assure proper heat penetration.

Sorting

Sort and inspect produce for defects throughout the preparation period to insure a product of the best possible quality. As the product is being removed from the hamper discard all bruised, shriveled, discolored, or soured portions. If produce has been held overnight, it should be checked carefully for signs of sweating or sliminess caused by overheating. In sorting, remove immature products as well as those that are overripe. Insofar as is practical, sand or dirt and foreign material should be removed before the product is washed to expedite the washing. Sorting is continued through all steps of preparation and questionable portions are discarded rather than to risk spoilage of the finished product.

Soaking

Soaking may be necessary before washing root crops or other products on which dirt has dried. However, soak products only when necessary for it slows up vegetable preparation and the cannery schedule.

Washing

Washing is not always the first step in the preparation of fruits and vegetables, but it is one of the most important steps of the canning process. Its purpose is to remove dirt and foreign material and to reduce the number of spoilage organisms present on the raw food. It also removes any spray residue that may have been left on the product. A clean, safe water supply is necessary to accomplish this purpose. Water must be changed often enough to keep it clean and thereby help to keep the bacterial count down to a minimum. Enough water must be used to allow for the moving and turning of the product freely in washing. Also amounts of the product placed in the washing tank at one time should be small enough to avoid matting and to permit thorough cleansing. Some products will need to be scrubbed with vegetable brushes. Others, such as greens, must be floated to assure thorough cleansing and to prevent the forming of mats which are difficult to separate. In some instances several washings may be necessary for satisfactory cleansing. When washing small products, such as berries, use a large strainer or wire basket with a small mesh to avoid crushing through unnecessary handling. The fruit is placed in a shallow layer in the container and is cleaned by dipping the basket up and down in the water until the dirt and sand are removed.

If large quantities of produce are to be washed at one time, mechanical washers and sprayers are more desirable and economical than washing tanks.

Cutting, Breaking, Peeling

Cutting, breaking, peeling, or removing stems, husks, or cores should be accompanied by close inspection of the produce and removal of all undesirable portions. Heat penetrates faster in processing when the product is cut or broken in uniform sizes. Rapid work will lessen discoloration from oxidation and help assure a finished product of high quality.

Discoloration

Discoloration in peaches, pears, and apples may be avoided by rapid preparation. When delay cannot be avoided after fruit is peeled and cut, the pieces of fruit may be placed in a wire basket and dipped for 2 minutes into a solution of 2 percent acid brine. The solution is made by adding 2 tablespoonfuls of salt and 2 tablespoonfuls of vinegar to each gallon of water used.

Some products also discolor because of the use of knives having an iron blade or because the cut pieces have been placed in a copper, iron, or galvanized iron container. Containers of aluminum, tin, or unbroken granite are recommended for use in preparing food.

In the case of beets, discoloration occurs after steaming owing to delay in completing their preparation. This can be avoided by quick cooling and prompt handling of beets after they are steamed. Discoloration may occur also when tops are cut too closely.

Another reason for discoloration in some products is the type of can used. When heated during exhausting or processing, sulfur is liberated from the protein in the product and combines with the metal in the can to form a tin or iron sulfide. Food thus discolored is not harmful when eaten but is unattractive in appearance. Such discoloration is avoided by use of the recommended type of container.

Discoloration by oxidation may also be present in canned food when head space is too great, when the container is not properly filled with the medium, or when exhausting has been insufficient. This type of discoloration is not necessarily accompanied by spoilage. Occasionally beets, carrots, or sweetpotatoes may have darkened layers that are caused by drought, excessive heat, or other conditions which have retarded their growth. When growth is resumed the darkened layers are formed. Such a product is undesirable for canning since not only the color but the flavor is affected. Moreover, heat penetration is slower through the tough, woody portion that forms these layers and, therefore, the processes given would be inadequate.

Scalding

Scalding is the heat treatment used for removing peel from such products as tomatoes, pears, and peaches. The fruit is placed in a wire basket and dipped into boiling water. Since the object is to heat the peel rather than the flesh of the fruit, it is kept in the water for only 30 to 60 seconds. Water must be boiling, for lower temperatures will soften the fruit instead of loosening the peel. Enough water must be used to maintain boiling temperature when the product is added and it must be changed frequently enough for cleanliness. A short, quick dip in cold water stops the heat treatment and shrinks the peel so that it can be removed easily. A cold spray may be used instead of the cold-water dip, but in either case the cooling should last only long enough to shrink or crack the peel on the fruit. Do not allow the product to stand in the cold water, but drain and peel it at once.

Steaming

Steaming is the heat treatment used to loosen skins before peeling root vegetables. This method is also used to break down or soften for pulping such products as pumpkin, apples, and tomatoes. Steaming is done under pressure.

For peeling, steam only long enough to loosen the skin but not to cook the product. Grade the vegetable for size when necessary and adjust the time of steaming accordingly to avoid uneven results. Produce that has been kept in storage will require longer steaming than that which is fresh. Remove the skins as soon as the vegetables are cool enough to handle without discomfort.

When steaming is done to soften the product for pulping, a steam-jacketed kettle or continuous-type exhaust box may be used as well as a retort. Such products should be of the highest quality and should be washed carefully and cut in uniform pieces for even steaming. Peels or rinds are usually left on since they are removed in the pulping process. If such steaming is done in a retort, use galvanized wire baskets or aluminum pans and do not let the product come in contact with uncoated iron as the vegetables will become discolored.

Retorts used in the steaming process are operated in the same manner as when used for processing but will have to be cleaned before they are used again for processing.

Blanching

Blanching is a heat treatment given some products by immersing them in water at 180° to 200° F. and following with a cold dip or spray. The temperature that gives best results in blanching varies with the product. Steam blanching should not be used unless a thermometer is attached to the steamer to indicate the temperature of the steam. The main purposes of blanching are to decrease the volume of the product so that it can be packed solidly and to obtain a well-filled can. This process serves to drive air and other gases from the plant cells and thus to prevent strain on can seams during processing and storage. The product becomes pliable when blanched and so may be packed closely into cans.

The objectives in blanching, however, are not the same for every product. With some, such as peas or lima beans, the blanch removes from the surface the sticky, gelatinous substance which, when present, might contribute to the increase of spoilage organisms. Some products are blanched to remove objectionable raw flavors; others to fix or set the green color; and with starchy products, like peas or corn, to take up water and prevent their swelling in the cans. With all products, blanching may be considered the final cleansing before the product is packed into cans. For that reason the blanching water is never used as a canning medium in filling cans. Blanching water must be changed often enough to insure its cleanliness and to remove spoilage organisms.

Best results in blanching are obtained when baskets are filled from one-half to two-thirds full. Overfilling of baskets will result in an unevenly blanched product. Matting of the leafy products may be avoided by moving the basket back and forth through the blanching water. Continue blanching only long enough to obtain the desired texture and color change. Overblanching causes a loss of nutrients, color, and flavor and a softened or slimy texture of the product.

Follow the heat treatment with a cold dip of 10 to 20 seconds of the blanched product. A spray may be used for this purpose instead of the cold-water tank, but in either case the cooling must be done quickly. The purpose of cooling is to stop the blanching process, separate the pieces of the product, and cool it enough to permit immediate packing. Do not start blanching if there is any reason for delay in completing the remaining steps of processing. Spoilage, including flat sour, occurs more rapidly after the product is heated.

Pulping or sieving is done to separate skins, seeds, cores, and fibrous material from the pulp of the steamed product. A pulping machine is desirable for use where large quantities of products are to be pulped. Small quantities may be pulped through hand-operated sieves. Work with these must be carried on rapidly in order to prevent oxidation of the product. When pulpers are fitted with a steam line, discoloration and oxidation can be kept to a minimum.

Reducing

Reducing is the process used to evaporate moisture from a pulped product or to evaporate juice by heating it in a steam-jacketed kettle or similar container. It is desirable to reduce such products as pumpkin, apples, or tomato pulp for improved texture and also to conserve the number of cans required. The product is heated slowly until it reaches the desired consistency. It should be stirred as little as possible.

PREPARATION OF CONTAINERS

Cans must be inspected and cleaned before they are used. Post a chart near the storage place where cans are issued to show the type of container most suitable for a specific product. (See table 2, page 34.) Issue cans to patrons on the basis of the number required per bushel or other measure of product that is to be canned. Table 3 on page 35 will help in computing the required number of cans. The supervisor should record the number of cans issued to each patron.

Just before filling, wash the cans in clean water. Soap should never be used in washing tin cans. Save unnecessary steps in can preparation by using can trays. Do not wash can covers as this possibly may damage the gaskets. Instead, keep covers in packing cartons to protect them from dust and moisture until they are to be used. They should be placed directly from the carton on the filled cans just before sealing.

FILLING OF CANS

Fill cans immediately after preparation to prevent oxidation which occurs after the product has been peeled or cut. The objectives in filling are to place the product so that it is protected from agitation within the can during processing or in transportation from the cannery, and to obtain a well-filled can when processing is completed. Pack the product closely to avoid air spaces which might not be removed in exhausting. Slack filling causes buckling of cans and may cause internal rusting. Fill cans as rapidly as possible after the product has been heated, as in blanching, to decrease the time necessary for exhausting and to avoid the possibility of flat sour spoilage.

Acid products, including fruit and tomatoes, must be packed into cans by the piece as they are peeled. Use a scoop or similar equipment for pouring berries into cans to avoid unnecessary handling. Cans may be filled quickly with peas, snap beans, lima beans, or corn by using the can as a scoop and dipping it into the blanched product with one hand while using the other to press the product into place. Filling cans in this manner necessitates only one dip of the can into the product and permits filling at a much higher temperature than when done entirely by hand. Tap the bottom of the can lightly on the table to settle the product in it and to assure a firm pack. Sometimes it is necessary to add to the product or remove some of it after tapping in order to obtain the right head space.

Overfilling slows heat penetration and places a strain on can seams which usually results in bulged can ends followed by spoilage. On the other hand, cans that have too much head space or contain too little medium after processing are either not sufficiently filled or are not properly exhausted.

Allowing for Head Space

Head space is the distance between the level of the product in the can and the top of the can. It varies with the product and style of pack in order to allow for expansion during processing. A 1/4-inch head space is most generally used. The head space most satisfactory for specific product is indicated in the canning instructions in this publication. In no case is it less than 1/4 inch when a canning medium is used. When products, such as applesauce and pumpkin, are packed without medium only enough head space is allowed to permit the sealing of cans. Leave no air space between the product and the can lid for it will cause oxidation and discoloration of the top layer of food. Do not consider the canning medium in measuring or adjusting head space.

Checking Weight of Can Contents

In some instances it may be desirable to check the weight of the product that is packed into the can. The drained weight indicates the amount of product that has been packed.

Net weight is the total weight of the contents of the can, including the product and the canning medium.

Drained weight is the weight of the product filled into the can. Weights for all products except tomatoes may be determined by turning the contents of the can out on a circular 1/8-inch mesh screen 8 inches in diameter and allowing them to drain 2 minutes. Weigh the materials remaining on the screen to obtain the drained weight. For cans larger than No. 3 use a 12-inch screen. For tomatoes, use a 1/2-inch mesh screen.

Adding Canning Medium

A canning medium is used to complete filling of cans after the head space is adjusted. It should be added boiling hot to shorten the time for exhausting. Fill cans completely full with the medium. It is better to have some canning medium spill over in sealing than to leave an air space between the product and the lid.

Brine is used as the canning medium for products other than tomatoes, pumpkin, and, perhaps, beets. (See directions for making brine, page 76.)

Canners' salt is preferred since it dissolves faster and stays in solution better than table salt. It may be purchased from any salt manufacturer. Dairy salt may also be used. Iodized salt or any salt with a filler added to prevent lumping is not used for canning. It is more economical to purchase a seasonal supply of salt at one time than to request patrons to furnish salt as needed. Store salt where it will stay clean and dry until it is used for brine. Impurities that will cause spoilage may be added through unclean salt. In making brine do not use water that is exceptionally hard or that contains an excessive amount of iron or other minerals. In some localities it may be necessary to filter, preheat, and settle or soften the water to make it usable. To insure a uniform result use a measured volume of water and weigh the salt in making each tank of brine. Empty the brine tanks at the end of each day and clean well to avoid contamination or rusting.

Salt tablets may be used instead of brine. If this is done, boiling water is added to fill the cans previous to exhausting and a salt tablet of the recommended size is placed on top of the product in each can just before the lid is put on. Salt tablets may be obtained for any standard size of can.

Sirup is the canning medium used for fruit. It may also be used for sweet-potatoes and yams. Fruits should not be water-packed if sugar is to be added later because they will lose flavor, color, and texture if cooked a second time.

Patrons should not use the time, equipment, or space necessary to make individual lots of sirup. It may be desirable to schedule the canning of fruit for a definite period of the day and request patrons to bring the amount of sugar that will be required for sirup of the consistency desired. (See table 9, page 76, for proportions of sugar and water for sirup.) For example, if it has been agreed that a medium sirup is satisfactory, each patron might be requested to bring 5 pounds of sugar for each bushel of fruit to be used.

Make the sirup in metal tanks from which it can be added to the fruit at boiling temperature. Clean sirup tanks thoroughly after using and chill with cold water. Rinse before using again.

EXHAUSTING

Exhausting is a heat treatment given after the cans are filled and before they have been sealed. It has the following purposes:

1. To expel air and other gases from food cells and to remove air that may have formed in pockets between portions of food in filling cans. This process relieves the strain on can seams during processing and storage. If the air is not removed, it creates pressure and after processing is completed it may cause bulging of can ends or breaking of seams. Removal of air also prevents internal rusting and discoloration of tin which occur when the metal reacts with oxygen.

2. To secure the right temperature for sealing that will create a vacuum in the can after processing is completed.

3. To complete the expansion or shrinkage of the product which assures a maximum fill without overfilling.

4. To prevent reaction of some products to the metal of the can. Cans are exhausted by steam or boiling water. When water is used it should come to within

2 inches of the tops of the cans. The cover on the batch-type exhaust box should be of proper height to give full circulation of steam above the cans, which aids in heating the product quickly and evenly. The amount of steam used in a continuous-type box should be adjusted to the product since the color and texture of the product may be injured by too rapid exhausting. This is particularly true of berries or other fruit that may be unduly softened if exhausted too quickly. Slower heating results in more complete elimination of air and other gases.

Some products do not need to be exhausted because preheating before sealing is accomplished by other methods. These products include applesauce, tomato pulp, pumpkin, and cream-style corn.

Center Can Temperature

The center can temperature is the temperature to which the produce must be heated before sealing. This temperature is determined by inserting a thermometer into the center of the can contents to within 1 inch of the bottom. This temperature is specific for each product, as indicated in the canning instructions.

The vacuum produced after processing will vary with the center can temperature — the higher the temperature of sealing the greater is the vacuum produced after cooling the cans. Higher temperatures than those indicated for sealing are not desirable.

Vacuum

A vacuum is obtained by filling cans to the recommended head space, exhausting to the proper center temperature, and sealing and processing cans immediately. Sufficient vacuum is indicated if the ends of the can contract on cooling and remain slightly concave after the cans have been placed in storage.

TOPPING

Topping or adjusting head space is the addition or removal of the product after exhausting is completed. The purpose is to give a well-filled can and to provide the recommended head space. This may be determined by pressing the contents of the can with the spoon after exhausting to see if the contents and canning medium are in accord with recommended head space. When more of the product must be added it should be taken from one of the exhausted cans that was heated at the same time as the can to be filled. Cans that have cooled below the center can temperature should not be used for adjusting head space. Sometimes it may be necessary to add canning medium to complete the filling of the can. It should be heated to boiling before it is used.

The need for topping is caused by the expansion of some products and shrinkage of others in exhausting. Also where there is a tendency to underfill tin cans when patrons are accustomed to canning in glass jars. However, greater expansion is possible in tin than in glass jars since the can ends expand slightly during processing and contract on cooling. Patrons should be carefully instructed with respect to filling cans so that need for topping is kept to a minimum.

SEALING

Sealing is the operation of closing the can so that it has a permanent closure which protects the food from infection by organisms present in the cooling water or in the air. It should be done as rapidly as possible following the exhausting of the product. Check the sealer frequently to be sure it is adjusted properly to form a perfect seal. (See instructions on operating sealers, page 52.) There should be no loss of time after sealing that will permit cooling of the cans before processing is started.

MARKING CANS

Cans are marked as they are sealed to identify the ownership of the processed product. This usually is done by the patron. It is desirable for the patron to exhaust all of his filled cans at one time to simplify the labeling. In a continuous-type exhaust box each patron's cans may be kept separate by placing a marker on the exhaust belt between each lot of produce. If one person does all the marking it will be necessary to keep a record of the sequence in which each patron's produce is placed in the exhaust box. All cans belonging to each patron are placed together in a batch-type exhaust box.

The use of a code rather than the full name will simplify and expedite the marking of cans. String beans, for example, may be identified by the code SB, lima beans by LB. The code used should remain constant throughout the season. Likewise, the patron's number should be used rather than the full name. It may be desirable to include the date for identification in event of spoilage.

Marking may be done by use of canners' ink and rubber stamps made up in code to give the desired information. The patron's number is added as needed to the standardized code. A carbon-base ink should be used and the marking done after cans are sealed.

Marking may also be done by use of a copper sulfate solution which is applied with a pointed stick. This etches the tin plate leaving a mark which cannot be removed. The solution should be used sparingly to avoid rusting. This method, however, is much slower than the use of a rubber stamp.

A copper sulfate solution can be made up according to the following formula:

1 ounce copper sulfate crystals
1 quart water
1 ounce 5 percent sulfuric acid solution

STACKING CANS

Cans should be stacked in the retort basket in such a manner as will permit free circulation of steam among them. Cans are usually stacked in an upright position. They should not be placed directly on top of one another but should be "staggered" to allow for rapid and complete circulation of steam which will aid in eliminating air from the retort. All cans of asparagus except "cuts" should be stacked in retorts so that the tips are down and the spears are in a vertical position.

PROCESSING

Processing is the heat treatment given to the produce after the cans are sealed. Its purpose is to destroy spoilage or poison-producing organisms that were present on the raw food or that were added in the preparation period. Processing does not sterilize the product but, done at the time and temperature recommended, it will insure the product's safety as a food and will give protection from spoilage if cans are properly cooled and stored. (See table 8, page 75.) The temperature which must be obtained in processing is the one necessary to insure a safe, wholesome product in the shortest time and still maintain as nearly as possible the natural color, flavor, and texture of the product. Temperatures that are too high or processing periods that are too long will produce a softened texture, darkened color, and a strong or carmelized flavor to the product. When the processing time and temperature are not adequate the product cannot be used with safety.

Steam-pressure Method

Steam pressure or a water bath is used in processing foods. The steam-pressure process is used for nonacid foods, which include meats, sea foods, and most vegetables. These must be processed at a temperature of at least 240° F., which is approximately 10 pounds pressure at sea level, and for varying lengths of time, depending on the product.

Water-bath Process

The water-bath process is used for acid products, such as fruit and tomatoes. Most acid products are processed at 212° F. and cans are covered with water throughout the processing period. A steam retort may also be used but it must be kept at approximately 2 pounds pressure for the same length of time as the water bath.

The time and temperatures recommended for either method are adequate only when wholesome produce has been used and when other canning operations meet recommended standards.

Rate of Heat Penetration

The rate of heat penetration is faster with products that are packed in liquid or that contain a large amount of liquid than with products that have greater density. Whole-grain corn packed in brine, for example, is processed for a shorter period than corn packed cream style. Heat penetration is not as slow for sweetpotatoes packed in sirup or brine as for the same product when a solid pack is used. Products that have great density, such as pumpkin, have a very slow rate of heat penetration. It is especially important when heat penetration is a factor that center can temperatures be maintained until processing is started so that the required temperature for processing can be obtained in the time recommended for each product.

ALTITUDE ADJUSTMENT

All time and temperatures used in this publication are for processes at sea level. (See table 7, page 74.) When using the water-bath process at altitudes higher than sea level add 1 minute for each 1,000 feet when the processing time is 20 minutes or less; 2 minutes for each 1,000 feet when the processing time is longer than 20 minutes. When products are canned under pressure at altitudes higher than sea level the pressure must be increased approximately 1/2 pound for each 1,000 feet. (See tables 7 and 8.) Specific information on processing time and temperature is included in the individual canning instructions for each product, which follows later in this publication.

COOLING

Cooling of cans should follow immediately after processing is completed. Place cans in a tank of clean, cold water or admit cold water into the retort under pressure. In either case, cool the cans to approximately 100° F. This temperature is low enough to avoid the growth of flat-sour or other thermophilic organisms but leaves enough heat to dry the can and prevent rusting. Only pure water should be used for cooling since the hot cans are fully expanded and the pressure within may draw water into the cans as the vacuum is produced.

Cans should be placed where cooling may be completed rapidly by air circulation. Do not stack cans on shelves that are fastened to the wall for this does not allow enough air circulation for rapid cooling. If cans are stacked before they are completely cooled there may be enough heat left to produce stack burn and flat sour spoilage in those at the center of the stack. For the same reason, cans should not be placed in cartons until they are completely cool.

STORAGE

Incubation Period

An incubation period or temporary storage of from 7 to 10 days is recommended after canning is completed. This gives time for detecting spoilage that becomes apparent immediately. Spoilage usually is indicated by bulging ends of the can or by leakage at the seams. Keep cans at a temperature of 70° to 75° F. during the incubation period, so that any bacteria present may grow more rapidly. When the patron rather than the cannery is responsible for the incubation period a report should be made to the cannery of all spoilage.

Storage Space

After cooling, cans are stored in a dry, well-ventilated place. The temperature should be as nearly constant as is possible, and moderately cold but not freezing. High storage temperatures impair the flavor, texture, and color of canned fruit and, in a less measure, of canned vegetables. Freezing affects the texture but not the color or flavor of canned products. Avoid storage space near steam pipes, radiators or stoves. Excessive moisture will cause cans to rust.

RELEASING CANNED PRODUCTS TO PATRONS

When canned products are released to patrons a receipt is usually given showing the number and size of cans received and their cost. Such a record includes the date of release and the date the product was canned. The form given below may be used for this purpose:

Patron's Production Record and Receipt

Name ______________________ Patron's No. ______________

Address ______________________ Date (Canned ______________
(
(Released ______________

Size container	Produce			Price per can	Total cost
	String beans	Tomatoes			

Paid ______________________
Supervisor

Patrons need to be informed as to the best method of storing processed cans for safekeeping. If for any reason cans must be taken from the cannery before they are thoroughly cooled, they should be placed where circulation of air will permit cooling en route and should be so arranged that cooling may be completed as soon as possible before cans are stored.

CANNING TROUBLES

SPOILAGE

Spoilage in processed foods is due to under-processing or poor sealing which permits the growth of bacteria, molds, or yeasts. Bacteria are the most serious problem in canning because of the large number of species and the wide range of temperatures at which they grow. The bacteria that cause food spoilage usually form spores resistant to heat. Molds are destroyed at very low temperature and are present only when processing has been insufficient or when there is a faulty seal through which the fungi may enter the can. Food on which mold grows becomes less acid and therefore favors the growth of bacteria that would not develop in an acid medium. Yeasts, also, are destroyed at relatively low temperatures. They grow most favorably where sugar and acid are present and cause spoilage by production of alcohol and gas.

Spoilage is not always indicated by the appearance of the can or of its contents. This is particularly true in the case of flat-sour spoilage and may be true of botulinus spoilage.

Flat sour in canned products is caused by the action of thermophilic bacteria which grow most favorably at temperatures of from 100° to 145° F. This spoilage is not accompanied by gas within the can. There is no bulging of can ends and no indication that spoilage has occurred until the can is opened. The spoilage is indicated by a sharp, sour odor and flavor and a cloudy liquor. This type of spoilage may develop either when the product is heated in storage before canning or at any stage in the canning process when the product has been heated and is allowed to remain at a temperature favorable for the growth of flat-sour bacteria. It commonly occurs when cooling has been done inadequately. Flat sour may develop also when cans have been properly cooled but have been stacked so closely after cooling that heating occurred in the center of the stack. This is true also of cans that are held in storage at too high temperatures.

Botulism is caused by eating or tasting food that contains the toxin produced in the growth of botulinus bacteria. This toxin is one of the most poisonous substances known and one-millionth of a gram is sufficient to cause death. The botulinus bacteria form spores which grow in nonacid foods only in the absence of oxygen and at temperatures between 50° and 100° F. The spores are present in all soil and may be present in any food. Spores are harmless until they grow and produce toxin.

Practically no spoilage may be indicated when the toxin from botulinus bacteria is present. Boiling the canned food will usually show up this poison by a bad or "off" odor. If there is no "off" odor, 10 minutes boiling will destroy the small amount of toxin for all vegetables except corn and spinach - they should be boiled 20 minutes. Any food suspected of being spoiled should be destroyed.

If canneries are carefully supervised and the equipment is in perfect working order, the processes included in this publication for nonacid foods are sufficient for the destruction of botulinus spores. But if there is any doubt about the way the food has been canned, patrons should be warned to boil canned vegetables 10 minutes before tasting them. Spinach and corn should be boiled 20 minutes. If the food looks queer or has an "off" odor, destroy it. (See page 72.)

Fermentation is a type of spoilage that occurs in fruits from the action of yeasts on sugar. Since yeasts are destroyed at relatively low temperatures, fermentation is due to underprocessing. This type of spoilage is accompanied by considerable pressure and both gas and liquid escape when the lid is punctured.

Spoilage from underprocessing usually can be detected within the incubation period if a relatively high, even temperature of 70° F. or above is maintained. This type of spoilage is usually indicated by bulging can ends and leaking seams.

Leaks are caused by a defective seam that may be the result of an improperly adjusted sealer or of failure to follow the manufacturer's instructions in the use of the sealer. Leaks may be so small as to escape notice while the can is cooling but will show up early in the incubation period because the released vacuum permits the entrance of air into the can and causes spoilage.

Buckling is the distortion of one or both ends of the can during processing or cooling due to pressure within the can. This may be the result of slack filling of cans, sealing at too low a temperature, or sudden release of pressure from the retort after processing. Buckling from release of pressure usually occurs with No. 3 or No. 10 cans rather than with the smaller sizes.

Panels are caused in No. 10 and occasionally in No. 3 cans by the pressure on the outside of the cans exceeding that on the inside to such an extent that the plate is pushed inward. Panels usually are not considered excessive unless the shape of the can body and ends are distorted. If excessive panels are found, it may mean that the pressure during cooling is too severe, or that the closing temperature is too high or the head space too great. The sides of the cans are pushed in only as far as the product is able to expand into the head space. Thus, with properly filled cans, the paneling is never so great as to cause the ends of the cans to be pulled out of position.

Swells is the term applied to cans when the ends are bulged because of spoilage This condition may be referred to also as flippers or springers, the latter terms being used when cans show a smaller loss of vacuum than is present when both ends are distended. The gas produced by the spoilage of can contents may come from growth of the bacteria that are present in underprocessed food or of those that have entered the can through a faulty seam. If swelling occurs in cans having a good vacuum after processing is completed and having no defects in seams, it is the result of underprocessing. Swells from this cause usually develop within the incubation period but may not become apparent until later if cans are stored in a cold room. There is an objectionable, sour odor with this type of spoilage and a darkening of the product from the action of the gas.

Hydrogen springers or hydrogen swells are cans that contain hydrogen gas produced by the reaction of acid products with the metal of the can. The appearance of the can is the same as with other types of gas spoilage. However, the reaction is slower than that from bacterial growth and there is no odor to the gas produced. If the gas is permitted to escape from the can slowly, it may be lighted with a match and will burn with a clear flame which indicates it is hydrogen. The product may look normal or be somewhat bleached in appearance, but will have no further indication of spoilage. Hydrogen springers develop when acid products have been canned in plain tin or in enameled cans that have been damaged through careless handling or sealing. The reaction between the fruit acid and the metal of the can starts at any point where the acid touches the tin.

Stack burn is the result of placing cans in stacks or cartons while they are too warm. The product within the can becomes heated when circulation of air is not sufficient to complete the cooling process. This causes the product to soften and darken in color and may result in a carmelized flavor.

Foreign flavors in canned food are usually acquired before the product is packed into cans. The acquired flavor may be due to the type of container used when the product is harvested or to undesirable storage conditions. Fruit is particularly apt to take up flavor from long storage in wooden boxes. Produce acquires a foreign flavor quickly when held in cold storage where there is little ventilation or when permitted to remain in containers until mold develops.

DISPOSAL OF SPOILED FOOD

Play safe. Don't give people, animals, or poultry a chance to taste spoiled canned food. Burn food that is spoiled. Or, with a stick, stir several spoonfuls of lye into the can of spoiled food and let it stand 24 hours — safely out of the reach of children or pets. Then bury the food, lid, can, stick, and all.

CANNING INSTRUCTIONS

The instructions included in this publication for processing both acid and nonacid foods have been limited to a few products that are universally canned. The methods suggested have been adapted from commercial canning practices and have proved, over a period of years, to be successful for use in community canneries.

The time and temperature tables are those developed by the National Canners Association. In using these processes it must be kept in mind that they are designed for use in commercial plants where the quality of product canned, the equipment used, plant sanitation, and supervision are carefully controlled. The processes are adequate for community canneries where conditions of operation and supervision meet the standards that have been suggested. Where there is any question of existing conditions or standards, 5 minutes should be added to each processing period as a safety factor.

All processing times are based on temperature at sea level. Altitude adjustments will need to be made as suggested heretofore.

Instruction sheets for other products may be obtained from the Office of Distribution, War Food Administration, Washington 25, D. C.

Table 7. - Gage pressure corresponding to specified process temperatures at various altitudes

Temp. deg. F.	Sea level	Feet above sea level -							Temp. deg. C.
		500	1,000	2,000	3,000	4,000	5,000	6,000	
200	-	-	-	-	-	-	-	-	93.3
205	-	-	-	-	-	-	0.5	0.9	96.1
210	-	-	-	0.4	0.9	1.4	1.8	2.3	98.9
212	0.0	0.2	0.5	1.0	1.5	2.0	2.4	2.9	100.0
215	0.9	1.1	1.4	1.9	2.4	2.9	3.3	3.8	101.7
220	2.5	2.7	3.0	3.4	3.9	4.4	4.9	5.3	104.4
225	4.2	4.5	4.7	5.2	5.7	6.2	6.6	7.1	107.2
230	6.1	6.3	6.6	7.1	7.6	8.0	8.5	9.0	110.0
235	8.1	8.3	8.6	9.1	9.6	10.0	10.5	11.0	112.8
240	10.3	10.5	10.8	11.3	11.7	12.2	12.7	13.1	115.6
242	11.2	11.4	11.7	12.2	12.7	13.1	13.6	14.1	116.7
245	12.6	12.9	13.1	13.6	14.1	14.6	15.0	15.5	118.3
248	14.1	14.3	14.6	15.1	15.6	16.0	16.5	17.0	120.0
250	15.1	15.4	15.6	16.1	16.6	17.1	17.5	18.0	121.1
252	16.2	16.4	16.7	17.2	17.7	18.1	18.6	19.1	122.2
255	17.8	18.1	18.3	18.8	19.3	19.8	20.2	20.7	123.9
260	20.7	21.0	21.2	21.7	22.2	22.7	23.1	23.6	126.7

Table 8. - Time and temperature for canning specified products

Product	Type of can	Center can temperature at closure	Time to process in boiling water (212° F.)		
			Size of cans		
			No. 2	No. 2½ or 3	No. 10
		° F.	Minutes	Minutes	Minutes
Acid foods					
Applesauce	Plain - L	190	10	15	20
Apricots	Plain - L	180	15	20	25
Berries	R-enamel - L	180	10	15	25
Cherries, dark	R-enamel - L	180	15	20	30
Cherries, light	Plain - L	180	15	20	30
Peaches, freestone	Plain - L or M	180	20	25	40
Peaches, cling	Plain - L or M	180	25	30	45
Pears	Plain - L or M	180	20	25	35
Sauerkraut	Plain - L	145	12	15	25
Tomatoes	Plain or R-enamel - M	140	50	55	90
Nonacid foods			Time to process at 240° F. (10 pounds pressure)		
Asparagus	Plain - M	180	26	26	35
Beans, green and wax	Plain - M	180	20	25	35
Beans, green lima	C-enamel - M	180	35	40	55
Beets, whole	R-enamel - M	180	30	30	40
Carrots	C-enamel - M	180	30	30	40
Corn, cream style	C-enamel - M	180	90	--	--
Corn, whole-grain	C-enamel - M	180	50	--	--
Peas, green	Plain - M	180	35	40	55
Pumpkin	R-enamel - M	180	70	95	190

Table 9. – Proportions of sugar and water for sirup

Percent of sugar	Consistency of sirup	Sugar needed per gallon of water			
		Pounds	Ounces	Cups	Quarts
20	Light	2	2	5	1-1/4
30	Moderately light	3	10	8	2
40	Medium	5	9	12-1/2	3-1/8
50	Moderately heavy	8	6	19	4-3/4
60	Heavy	12	8	28	7

Prepare sirup in advance of the time it is to be used. Boil the sugar and water together for 5 minutes to dissolve the sugar and remove air from the sirup. Skim off any skum that forms on top. The sirup should not be boiled too long because the water will evaporate and the desired consistency will not be obtained. Reheat to boiling before filling cans.

The pounds of sugar needed may be estimated from the table given. From 3/4 to 1 cup of sirup should be allowed for each No. 2 can of fruit.

BRINE

A 2-percent brine is satisfactory for use when the variety of products processed is as great as generally occurs in a community cannery.

To obtain a 2-percent brine, use 16.5 pounds of pure salt to each 100 gallons of water used. Canners' salt is recommended for making brine. Use pure water and weigh the salt used for a measured volume of water. Heat to boiling before using.

APPLESAUCE

Container: Use plain tin cans.

Quality of product: Applesauce of good quality may be made from small, poorly shaped apples so long as they are sound and of good flavor. Any apples used must be free from mold, bruises, and worm holes.

Preparation: Wash apples carefully to remove all traces of dirt and spray residue. Apples for sauce need not be peeled. Cut away blemishes and bruised portions and remove cores. Trim carefully to assure applesauce of desirable flavor and color.

Pulping: Use a steam-jacketed kettle or large stock pot for steaming apples. Cook only long enough to soften the apples. Strain apples. Add 1 cup of sugar for each gallon of apple pulp. Heat to boiling.

Filling: Fill boiling applesauce into cans leaving only enough head space to allow for placing a lid on the can.

Exhausting: It is not necessary to exhaust applesauce if it is filled into cans at a boiling temperature and sealed immediately. To insure a high closing temperature, cans should not be filled faster than they can be sealed.

Sealing: The sealing temperature should not be below 190° F. Too low temperature will cause hydrogen springers. Do not permit cans to cool after sealing and before processing.

Processing: Process applesauce in boiling water, as follows:

No. 2 cans - 10 minutes
No. 2½ cans - 15 minutes
No. 3 cans - 15 minutes
No. 10 cans - 20 minutes

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and should be stacked in a well-ventilated place until cold. Do not put cans into cartons until they are cold and dry.

APRICOTS

Container: Use plain tin cans.

Quality of product: Use apricots that are fully ripe but firm. Be careful to avoid bruising fruit in handling or in transportation.

Preparation: Remove green, overripe, bruised, or defective fruit. Wash thoroughly. Apricots may be canned in four ways -- as pitted halves unpeeled, pitted halves peeled, whole unpeeled, and whole peeled. For peeling, dip the apricots into boiling water for about 1 minute, then plunge them into cold water and peel. If desired, halve and pit after peeling.

When pitted apricots are canned, it is recommended that one or two pits be added to each can to improve the flavor.

Filling: Fill cans to within 1/4 inch of the top. Add boiling sirup to fill the can completely. A medium or heavy sirup may be used. Allow 3/4 to 1 cup for each No. 2 can of apricots. Boil sugar and water together for 5 minutes and remove any scum that forms on the top. Set aside until needed. Do not continue heating, as this will concentrate the sirup more than is desirable, but heat to boiling just before using.

Exhausting: Exhaust apricots to a center can temperature of 180° F.

Sealing: Seal cans as soon as the 180° F. temperature is reached. Do not permit cans to cool after exhausting and before processing.

Processing: Process apricots in boiling water (212° F.) as follows:

No. 2 cans - 15 minutes
No. 2½ cans - 20 minutes
No. 3 cans - 20 minutes
No. 10 cans - 30 minutes

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water, they should be tilted to drain off excess water, and should then be stacked in a well-ventilated place until cold. Do not put cans into cartons until they are cold and dry.

BERRIES

Container: Use R-enamel cans.

Quality of product: Berries should be canned while they are fresh. They should be ripe but firm and free from mold or other signs of spoilage. Berries cannot be held long without a high percentage of loss. They should be harvested and transported in shallow, well-ventilated crates to avoid heating or mold.

Preparation: Sort berries to remove green, overripe or defective fruit, and leaves, stems, or other foreign material.

Place berries in shallow layers in a large colander or small-mesh wire basket. Dip up and down in water to remove dirt and foreign material without too much handling of fruit. Do not let berries stand in water but remove them as soon as they are clean.

Filling: Fill berries into cans, packing them as closely as possible without crushing the fruit. Fill to within 1/4 inch of the top of cans.

Fill cans completely with boiling sirup. A medium sirup is desirable for berries. It should be made by boiling the sugar and water together for 5 minutes and removing any scum that forms. Do not let sirup cook longer than necessary as it will be too concentrated.

Exhausting: Exhaust berries to a center can temperature of 180° F.

Sealing: Seal cans as soon as the exhaust temperature is reached. Do not permit cans to cool after exhausting and before processing.

Processing: Process berries in boiling water (212° F.) as follows:

No. 2 cans - 10 minutes
No. 2½ cans - 15 minutes
No. 3 cans - 15 minutes
No. 10 cans - 25 minutes

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans into cartons until they are cold and dry.

CHERRIES

Container: For the light-colored cherries, type L plate without enamel should be used, and for the dark cherries type L plate with R-enamel. Cherries in plain tin cans or plain tin with enamel produce hydrogen springers very quickly.

Quality of product: Cherries should be ripe but firm and should be canned while they are fresh. Fruit showing bruises or signs of rot should not be used.

Preparation: Discard bruised, overripe or underripe, rotted, or otherwise inferior fruit. Remove leaves, stems, and other foreign material. Wash thoroughly. Pricking helps to prevent splitting of the cherries during processing.

Filling: Fill cans to within 1/4 inch of the top. Add boiling sirup to fill the cans completely. Allow 3/4 to 1 cup of medium sirup for each No. 2 can of cherries. Boil sugar and water together for 5 minutes, and remove any scum that forms on top of the sirup. Do not continue cooking, as this will concentrate the sirup more than is desirable, but heat to boiling just before using.

Exhausting: Exhaust cherries to a center can temperature of 180° F.

Sealing: Seal cans immediately after removal from exhaust box. Do not permit cans to cool after exhausting and before processing.

Processing: Process cherries in boiling water (212° F.) as follows:

No. 2 cans - 15 minutes
No. $2\frac{1}{2}$ cans - 20 minutes
No. 3 cans - 20 minutes
No. 10 cans - 30 minutes

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water, they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

PEACHES

Container: Use plain tin cans.

Quality of product: Use peaches that are fully ripe but firm. Peaches for canning should be slightly less ripe than for eating fresh. Soft fruit should be used for butter, sauces, or preserves. Use care to avoid bruising fruit in handling or in transportation.

Preparation: Remove green, overripe, or defective fruit. Place freestone peaches in a blanching basket and dip into boiling water for 1 to 2 minutes, according to the ripeness of the fruit. Water under boiling temperature will cook rather than loosen the skin of peaches. Remove blanching basket from boiling water and dip into cold water to stop the peaches from heating and to loosen their skins. Do not permit peaches to stand in cold water. Slip off skins, cut peaches in halves, and remove the seed. Peaches may be canned either as halves or slices. If desired, one cracked seed may be added to each can for flavor.

To peel cling peaches, dip the basket of peaches in a boiling lye solution (containing 1½ percent of canners' lye) for 15 to 30 seconds. Do not leave in the lye long enough to remove the skins. Transfer to a tank of cold water, raise and lower the basket several times, and shake slightly. Repeat in a second tank of cold water. This procedure should wash the lye off the peaches and remove the skins. Then proceed as for freestone peaches.

If it is necessary for peaches to stand any length of time after peeling and before filling into cans, discoloration may be prevented by dipping the fruit for 2 minutes in an acid-brine solution made of 2 tablespoonfuls of vinegar and 2 tablespoonfuls of salt added to each gallon of water needed.

Filling: Pack peaches closely into cans in overlapping layers. Fill to within 1/4 inch of the top of can.

Add boiling sirup to fill the can completely. A medium or heavy sirup may be used. Make sirup before peaches are peeled, allowing 3/4 to 1 cup for each No. 2 can of peaches. Boil sugar and water together for 5 minutes and remove any scum that forms on the top. Set aside until needed. Do not continue heating as this will concentrate the sirup more than is desirable but heat to boiling just before using.

Exhausting: Exhaust peaches to a center can temperature of 180° F.

Sealing: Seal cans as soon as the 180° F. temperature is reached. Do not permit cans to cool after exhausting and before processing.

Processing: Process peaches in boiling water (212° F.) as follows:

	Freestone peaches	Cling peaches
No. 2 cans	20 minutes	25 minutes
No. 2½ cans	25 "	30 "
No. 3 cans	25 "	30 "
No. 10 cans	40 "	45 "

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

PEARS

Container: Use plain tin cans.

Quality of product: Pears develop a better flavor and finer texture if they are taken from the tree when somewhat underripe and held in crates for 5 to 10 days for ripening.

Preparation: Discard bruised, rotted, wormy, or other inferior fruit. Pears may be peeled by hand or, if ripe, may be placed in a blanching basket and dipped into boiling water for 2 to 3 minutes. Water under boiling temperature will cook rather than loosen the peel on pears. Remove pears from the boiling water and dip into cold water to stop the cooking and loosen the skin. Do not let pears stand in cold water but remove and peel at once.

Cut pears in halves and remove the core. A curved knife blade is desirable if many pears are to be cored. Trim away any blemishes as pears are peeled.

Peeled pears may be dipped into an acid-brine solution to prevent darkening. To make this brine use 2 tablespoonfuls of vinegar and 2 tablespoonfuls of salt for each gallon of water needed. Dip pears into solution for 2 minutes.

Filling: Pack halves of pears closely into cans in overlapping layers, filling to within 1/4 inch of the top of the can.

Add boiling sirup to fill the cans completely. Sirup should be made before pears are peeled. Allow 3/4 to 1 cup of medium sirup to each No. 2 can of pears. Boil sugar and water together for 5 minutes and remove any scum that forms on top of sirup. Do not continue cooking as this will concentrate the sirup more than is desirable but heat to boiling just before using.

Exhausting: Exhaust pears to a center temperature of 180° F.

Sealing: Seal cans immediately after removal from exhaust box. Do not permit cans to cool after exhausting and before processing.

Processing: Process pears in boiling water (212° F.) as follows:

No. 2 cans - 20 minutes
No. $2\frac{1}{2}$ cans - 25 minutes
No. 3 cans - 25 minutes
No. 10 cans - 35 minutes

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

TOMATOES

Container: Use plain tin cans; R-enamel may be used if desired to protect the color.

Quality of product: Tomatoes for canning should be fully ripe but firm. Vine-ripened tomatoes give the best flavor and color. Smooth, regular shapes are more easily prepared and losses in preparing them are lower than for those of irregular shapes. Tomatoes should be handled in containers that give protection from crushing. Broken, moldy, or diseased tomatoes contaminate the hampers and add danger of spoilage in canning.

Preparation: Sort tomatoes and remove those that are green, overripe, moldy, wormy, sunburned, or otherwise defective. Wash carefully, changing water often enough to insure thorough removal of dirt and spray residues.

Scalding: Place clean tomatoes in blanching basket and dip them into boiling water for 1/2 to 1 minute, according to the ripeness of the tomatoes. Water under boiling temperature will cook tomatoes rather than loosen the skins. Dip the tomatoes into cold water to stop the cooking, and to crack the skins in order to make peeling easier.

Peeling: Use a Smiley tomato knife or sharp-pointed peeling knife to remove cores. At the same time twist the tomato in the opposite direction to remove the skin. Remove green or sunburned spots.

Filling: Pack tomatoes into cans, pressing them close to give a well-filled can. Fill cans completely full. Do not add any water to tomatoes. Add salt using 1/2 teaspoonful to each No. 2 can and 1 teaspoonful to each No. 3 can of tomatoes.

Exhausting: Exhaust tomatoes to a center can temperature of 140° F.

Sealing: Seal cans immediately after removal from exhaust box. Do not permit cans to cool before sealing and processing.

Processing: Process tomatoes in boiling water (212° F.) as follows:

No. 2 cans - 50 minutes
No. 2½ cans - 55 minutes
No. 3 cans - 55 minutes
No. 10 cans - 90 minutes

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

ASPARAGUS

Container: Use plain tin cans with C enamel lids. Plain lids may be used, but if they are, discoloration may result. This discoloration is not harmful.

Quality of product: Only young, tender stalks should be used, and they should be canned as soon as possible after harvesting, or they will become tough and bitter. White asparagus is cut below the ground before the stalk has been exposed to the light. Green asparagus is cut after the stalks have grown about 9 inches above the ground. With both styles, deformed stalks and those showing evidence of rust should not be used. Stalks with tight heads make the most attractive pack.

Preparation: Cut stalks to length, about 1/4 inch less than the height of the can. The fibrous ends which are removed are too tough for food and should be discarded. Wash thoroughly. Stalks can be packed whole or cut in sections, preferably about an inch long (asparagus cuts).

Blanching: Blanch at from 190° to 200° F. Place the asparagus in a blanching basket and submerge in the blanching water until sufficient wilting has occurred. This takes from 3 to 5 minutes, depending on the toughness of the stalks.

Place the blanched asparagus quickly in cold water to stop the blanching process and to cool the stalks sufficiently so that they can be packed immediately. Do not allow the asparagus to remain in the cooling water more than a few seconds.

Filling: If the asparagus is to be packed whole, sufficient stalks to fill the can should be gathered in a bundle, with the cut ends down. The bundle should then be worked into the mouth of the can with the cut ends down and the can tapped on the table to settle the stalks to the bottom. Too tight a pack should be avoided.

Pack asparagus cuts into cans by using the can as a scoop and dipping it into the asparagus sections with one hand while pressing them down with the other. Tap the can sharply on top of the table to settle the sections. Adjust filling by adding or removing asparagus to give a 1/4-inch head space.

Add boiling hot brine to fill the can completely.

Exhausting: Exhaust to a center can temperature of 180° F.

Sealing: Seal cans immediately after removing from the exhaust box and place at once in the retort. Do not permit cans to cool before processing.

Processing: Cans containing whole spears must be placed in the retort in a vertical position with tips down. If they are placed on their sides, serious underprocessing may result.

Process asparagus as follows:

No. $2\frac{1}{2}$ or smaller cans - 26 minutes at 240° F. (10 pounds pressure)
No. 10 cans (cuts only) - 35 " " "

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and should then be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

BEANS, GREEN AND WAX

Container: Use plain tin cans.

Quality of product: Snap beans for canning should be fresh and tender and as free as possible from strings or fiber. When beans have become so mature that the seed leaves the pod when cooked, they should be dried and not canned. The time and temperature given here for processing snap beans will not be adequate for overmature beans.

Slat hampers or baskets that afford good ventilation are best for harvesting or transporting string beans since beans may heat and become slimy when packed in tight containers. Burlap bags should not be used for beans because the rough surface of the pod catches lint that is almost impossible to remove in washing.

Beans should be canned as soon as possible after harvesting for they become wilted, darkened, and tough if held too long in storage.

Preparation: Beans are harvested while they are dry; therefore, they have relatively no loose soil on the pods when ready for preparation. For that reason, and because of the difficulty in handling a large quantity of wet beans, they are not washed before preparation is begun. Snap the ends and break or cut the beans into segments. A quick method is to snip the stem end of the bean and at the same time inspect it for insect injury or other defect. There is no reason for removing the blossom end of stringless beans. The beans may be broken quickly and almost simultaneously with the snipping by pressing the bean with the thumb between the index and middle fingers of the hand holding the pod. Where it is desirable to snip both ends this may be followed by breaking or the beans may be cut on a cutting board by using a sharp knife and cutting several pods at one time. Beans are usually cut or broken into 1½-inch lengths.

Wash beans carefully when cutting or breaking is completed.

Blanching: Blanch beans at 190° to 200° F. Place the beans in a blanching basket and submerge in the blanching water. Continue the blanch only long enough for the beans to become pliable, which takes from 3 to 5 minutes. Over-blanching causes beans to become soft or slimy.

Plunge blanched beans quickly into cold water to stop the blanching process and to cool just enough to make immediate packing possible. Do not let beans remain in the cooling water for more than a few seconds.

Filling: Using the can as a scoop, fill it with beans by dipping it into the blanched beans with one hand and pressing them down into the can with the other. Tap the can sharply on top of the table to settle the beans. Adjust filling by adding or removing beans to give 1/4-inch head space. Add boiling brine to fill the cans completely.

Exhausting: Heat in steam or hot water exhaust to a center temperature of 180° F.

Sealing: Seal cans immediately after removing from the exhaust box and place them at once in retort. Do not permit cans to cool before processing.

Processing: Process snap beans as follows:

No. 2 cans or smaller - 20 minutes at 240° F. (10 pounds pressure)
No. 2½ cans - 25 " " "
No. 3 cans - 25 " " "
No. 10 cans - 35 " " "

Cooling: Immediately after processing is completed, cool cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water and should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

BEANS, GREEN LIMA

Container: Use C-enamel cans.

Quality of product: Only young and tender lima beans should be canned. Older beans should not be canned because of the high starch content, but they may be dried successfully. Lima beans have reached the proper maturity for canning when the pods are still green but the beans are easily shelled. They should be handled in small quantities so they may be canned quickly.

Preparation: Shell lima beans as soon as possible after harvesting. Discard defective beans. Wash in a wire basket by dipping the basket up and down in the washing water until the beans are clean.

Blanching: Blanch at 190° to 200° F. Place lima beans in the blanching basket and dip into blanching water from 3 to 5 minutes, depending on the size and maturity of beans. Smaller beans are blanched at the higher temperature and for the shorter period of time. More mature beans are blanched 4 to 5 minutes at 190° F. to prevent bursting of the skins.

Filling: Drain beans and fill at once to within 1/2 inch of the top of cans. Fill cans completely with boiling brine.

Exhausting: Exhaust to a center can temperature of 180° F.

Sealing: Seal cans immediately after removal from the exhaust box and place at once in the retort.

Processing: Process lima beans as follows:

No. 2 cans - 35 minutes at 240° F. (10 pounds pressure)
No. 2½ cans - 40 " " "
No. 3 cans - 40 " " "
No. 10 cans - 55 " " "

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put in cartons until they are cold and dry.

BEETS

Container: Use R-enamel cans.

Quality of product: Use young tender beets for canning. Beets should be canned soon after harvesting since storage for any length of time may result in a bitter flavor. Beets that are of a uniform dark red color are more desirable for canning than those of lighter color. Beets that have been slowed in development by dry weather should not be canned since they will be fibrous and woody.

Preparation: Leave the root and 1 inch of the leaf stalks on the beets to prevent the bleeding of red color during steaming. Wash the beets thoroughly. It may be desirable to soak beets to loosen dirt before washing. Use a vegetable brush in washing but take care not to break the skin or root. The last washing should show no evidence of dirt.

Beets are graded for size during washing to give uniformity when they are steamed for peeling. They are sorted usually into three sizes as follows:

Small - less than 1 inch in diameter
Medium - 1 to 1½ inches in diameter
Large - more than 1½ inches in diameter

Beets larger than 2 inches in diameter are cut before canning. Those smaller than 2 inches in diameter are usually canned whole.

To facilitate peeling, steam beets at about 230° F. (6 pounds pressure) for 10 to 15 minutes, according to the size. Wire-lined retort crates or blanching baskets may be used for placing beets in the retort.

Cool beets in cold water immediately on removal from the retort. Do not cool more than is necessary for handling beets in peeling. Complete cooling or delay in peeling will make the peel more difficult to remove. Slip peel off beets by hand. Trim off any blemishes or woody portions. If the whole beet is fibrous it should be discarded, since heat penetration will be retarded and spoilage may result.

Large beets may be quartered or sliced before filling into cans. Slices are usually 3/8-inch thick.

Filling: Cans should be filled as soon as beets are peeled. There should be no delay in filling since beets darken rapidly after peeling or slicing. Pack close in cans leaving 1/4-inch head space. Fill can completely with boiling hot water or brine.

Exhausting: Exhaust beets to a center can temperature of 180° F.

Sealing: Seal cans immediately after removing from exhaust box and place at once in retort. Do not permit cans to cool before sealing and processing.

Processing: Process beets as follows:

No. 2 cans	- 30	minutes	at	240° F.	(10 pounds pressure)
No. 2½ cans	- 30	"	"	"	
No. 3 cans	- 30	"	"	"	
No. 10 cans	- 40	"	"	"	

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

CARROTS

Container: Use plain tin cans.

Quality of product: Carrots for canning should be crisp and tender. Only fully matured carrots should be used since those that are underdeveloped will lack flavor. Carrots that have become fibrous or woody because development was slowed by dry weather or poor soil should not be canned since heat penetration would be slow and spoilage may result. The best flavor and quality is obtained from carrots that have developed rapidly.

Preparation: Leave 1½ to 2 inches of the leaf stalk at the top for holding the carrot while peeling. Soak carrots if necessary to loosen soil before washing. Scrub with a stiff brush until carrots are clean.

Use the top of the carrot for holding while removing a thin peel from the carrot. This may be accomplished quickly by using an up and down stroke with a knife while rotating the carrot with the other hand. Remove the top when peeling is completed.

Cut carrots into desired sizes. Carrots may be sliced or cut in wedges for canning. A satisfactory method of cutting is to remove 1½ inches from the bottom of the carrot and to cut the upper portion in halves. Wash carrots before filling into cans.

Filling: Pack carrots into cans as close as possible, leaving 1/4-inch head space. Fill cans completely with boiling hot water or brine.

Exhausting: Exhaust carrots to a center can temperature of 180° F.

Sealing: Seal cans immediately after removing from exhaust box and place at once in retort. Do not permit cans to cool after exhausting and before processing.

Processing: Process carrots as follows:

No. 2 cans	- 30	minutes	at	240° F.	(10 pounds pressure)
No. 2½ cans	- 30	"	"	"	
No. 3 cans	- 30	"	"	"	
No. 10 cans	- 40	"	"	"	

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

CORN, CREAM-STYLE

Container: Use only No. 2 C-enamel cans.

Quality of product: Maturity for canning is indicated generally by the appearance of the silks which are dried at the tip but green next to the husks. The best test for maturity is to open a few ears and press the kernel with the thumb nail. Milk from the kernel should be creamy rather than watery. When the grain is tough and the liquid is starchy, the corn is too old for canning and should be dried, salted, or brined.

Corn remains in the canning stage only a few hours. There is a rapid change of sugar to starch after the corn reaches maturity and this change occurs more quickly after harvesting; therefore, there should be the least possible delay between harvesting and canning and only such a quantity as can be canned quickly should be harvested. Care must be used in harvesting and transporting corn to the cannery to avoid heating which occurs readily when corn is packed too close. Heating will lower the quality of canned corn and may result in spoilage.

Preparation: Husk and silk corn, removing as much silk as possible with the husk. A table in the receiving area is used for this part of the preparation. Cut away all wormy portions and blemishes with a sharp knife. Discard ears that have smut growth or other disease. Remove silk with a medium stiff brush. Wash the corn in cold water and remove the remaining silks and any foreign material by using a similar stiff brush. Grade the corn as it is washed and reserve the more mature ears for cream style and the others for whole-grain canning.

Cut the corn at the preparation table; use sanitary practices that will avoid contamination which occurs very readily at this time. A wooden block approximately 4 inches square and 1 inch thick that has a 6-penny nail driven through the center and extending 3/4 inch to 1 inch should be placed in the bottom of the preparation pan for cutting the corn. Place the block in the cutting pan with the butt of the ear secured on the nail so that when cutting the knife strikes against the wood rather than the pan. Hold the corn ear in position and revolve it as necessary with one hand while cutting the kernels with the other. To insure a product of good quality it is important that corn be cut in a proper manner with a sharp knife. A thin 8-inch butcher knife is best for cutting corn. In cutting, start the knife at the top of the ear and slice downward with a diagonal motion using as little pressure on the knife as possible and one motion from the top to the bottom of the ear. Cut a slice as thin as possible and attempt to remove 1/16 inch to 1/8 inch in this slice. Turn the knife over and use the back to scrape the exposed pulp, taking care not to scrape so deep as to include any part of the cob, as this will give an undesirable flavor and color to the finished corn. Do not cut too many rows at one time or it will be impossible to get a layer as thin as desired. When cutting is finished the cob should be round with all grain pockets remaining on the cob. It is desirable, for one person to cut and another to do the scraping, when possible, as this will quicken the preparation and make the cutting easier.

Blending: Blending is accomplished by constant stirring or agitation while the corn is heating and at the same time adding sirup or water to secure the proper consistency. Where sweet corn of proper maturity is used, water rather than sirup may be used in blending. With older corn, sirup should be used and should be prepared before the corn is cut. Sirup is made by adding 14 to 16 ounces of sugar and 3 ounces of salt to each gallon of water used. Heat sugar, salt, and water to the boiling point and boil 5 minutes removing any scum that forms on top. Use approximately 3/4 cupful of water or sirup to each No. 2 can. Blending is best accomplished by the use of a steam-jacketed kettle or an open tank that is heated by open steam pipe. Where corn is heated over direct heat caramelization may occur. Apply any heat slowly to avoid caramelization or scorching. Heat corn to 190° to 200° F. Add sirup or water as necessary to obtain a consistency that is neither starchy nor pasty. Keep stirring corn while adding sirup or water. Cook the corn until it reaches the consistency of thin cream and when dropped from a spoon or paddle will seek its own level. The corn will thicken in processing and cooling and should not be too thick when processing is completed.

Filling: Fill corn into cans at 190° to 200° F. leaving 1/4-inch head space.

Exhausting: It is not necessary to exhaust cream-style corn if the corn is sealed immediately after filling. A sealing temperature of 180° to 190° F. must be maintained.

Sealing: Seal cans as they are filled and place them immediately in the retort. Do not permit cans to cool before processing.

Processing: Process No. 2 cans of cream-style corn at 240° F. (10 pounds pressure) for 90 minutes.

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

CORN, WHOLE-GRAIN

Container: Use only No. 2, C-enamel cans.

Quality of product: Slightly less mature corn is used for whole grain than for cream style and may be selected by sorting the corn during the first stage of preparation for canning. The general standards for quality and preparation of corn are the same for whole-grain as those given for cream-style corn.

Pre-cooking: Pre-cook ears of corn 3 to 5 minutes or until the starch sets. Test with a fork or other sharp implement to see when the milk has set in the kernels.

Cutting: Use cutting board with a nail in the center and set the butt end of the corn on the nail. Cut with one hand and revolve the ear of corn with the other. A thin sharp knife, preferably a 6-inch butcher knife, is best for this purpose. Do not cut too many rows at one time as this will cause cutting too close to the cob. Cut 2/3 of the total depth of the kernel and use one stroke of the knife to cut from the top to the bottom of the ear. Deep cutting will remove chaff of cob which gives an off-flavor and darkened color. Do not scrape the cob since the processing time for whole grain is based on clear brine and requires a shorter process than for cream style.

After cutting, wash kernels of corn on a screen. A screen may be made of fine mesh hardware cloth fastened over a small wooden box. This will permit the chaff and small particles to go through the mesh but retain the kernel and make possible a clear liquor.

Filling: Pour corn into cans, leaving 1/2-inch head space. Fill cans completely with boiling brine.

Exhausting: Exhaust to a center can temperature of 180° F.

Sealing: Seal cans immediately after removing from the exhaust box, and place in retort to prevent loss of temperature before processing.

Processing: Process No. 2 cans of whole-grain corn at 240° F. (10 pounds pressure) for 50 minutes.

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

PEAS, GREEN

Container: Use plain tin cans.

Quality of product: Only young tender peas should be canned. Peas that are overmature should be dried. Peas should be canned promptly after harvesting.

Preparation: Shell peas by hand or with a pea huller. Shelling is accomplished more readily when peas are fresh and crisp. Hand shelling may be quickened by placing peas in a blanching basket, dipping them for a few seconds into boiling water, and following by plunging them quickly into cold water. Discard broken, ripe, or hard peas as they are shelled. After peas have started to lose their bright color they should not be canned because they are too mature.

Do not permit peas to stand after shelling but complete the canning process as soon as possible to obtain the best quality.

Wash peas in a large colander or blanching basket lined with No. 6 mesh hardware cloth. Dip them up and down in cold water removing imperfect peas or particles of pod that float to the top of the water.

Blanching: Blanch peas for 3 to 5 minutes at 190° to 200° F.

Blanching is an important step in the canning of peas. One of the principal objectives in blanching is to remove mucous substance and starch from peas in order to give a clear liquor.

The blanch is followed by a quick plunge into clean, cold water.

Filling: Peas should be poured into cans immediately after blanching. Fill to within 1/4 inch of the top of cans. Fill cans completely with boiling water or brine.

Exhausting: Exhaust peas to a center can temperature of 180° F.

Sealing: Seal cans immediately after removing from the exhaust box and place at once in the retort. Do not permit cans to cool before processing.

Processing: Process green peas as follows:

No. 2 cans -35 minutes at 240° F. (10 pounds pressure)
No. 2½ cans - 40 " " "
No. 3 cans - 40 " " "
No. 10 cans - 55 " " "

Cooling: Immediately after processing is completed, cool the cans as rapidly as possible to 100° F. This leaves enough heat in the cans to dry them and prevent rusting. When the cans are removed from the cooling water they should be tilted to drain off excess water, and then should be stacked in a well-ventilated place until cold. Do not put cans in cartons until they are cold and dry.

PARTIAL LIST OF MANUFACTURERS OF CANNING EQUIPMENT

(In furnishing this partial list, no discrimination is intended and no guarantee of reliability is implied.)

Boilers

Orr & Sembower, Inc., Reading, Pa.
Hamburg Boiler Works, Inc., Hamburg, Pa.
Birchfield Boiler Co., Tacoma, Wash.
Garwood Industries, Highland Park, Mich.
Milwaukee Boiler Mfg. Co., Milwaukee, Wis.
Lockout Boiler Mfg. Co., Chattanooga, Tenn.
Scott-Newcomb, Inc., St. Louis, Mo.

Large-scale canning equipment

Anderson-Barngrover Division, Food Machinery Corp., San Jose, Calif.
Ayars Machine Co., North Salem, N. J.
Berlin Chapman Co., Berlin, Wis.
F. H. Langsenkamp Co., Harmon & South Streets, Indianapolis, Ind.
A. K. Robins & Co., Inc., 111 Concord St., Baltimore, Md.
Sprague-Sells Division, Food Machinery Corp., 101 E. Maple Street; Hoopeston, Ill.

Pressure retorts

Continental Can Co., Athens, Ga.
J. P. Dowell Co., McKinney, Tex.
A. K. Robins Co., Baltimore, Md.
Food Machinery Corporation, Hoopeston, Ill.
Berlin Chapman Company, Berlin, Wis.

Combination pressure cooker, canner, and stock pot

Legion Utensils Corporation, Long Island City, N. Y.

Pressure canners (7 and 14 quart)

Burpee Can Sealer Co., Barrington, Ill.
National Aluminum Manufacturing Co., Peoria, Ill.
Wisconsin Aluminum Foundry Co., Manitowoc, Wis.
The Pressure Cooker Co., Denver, Colo.
National Pressure Cooker Co., Eau Claire, Wis.
Lakeside Aluminum Co., Menomonie, Wis.
Advance Aluminum Co., Chicago, Ill.

Steam-jacketed kettles

Lee Metal Products Company, Philipsburg, Pa.
Mongrum-Holbrook and Elkus, San Francisco, Calif.
Bucyrus Kettle Works, Bucyrus, Ohio

Can sealers

Max Ams Machine Co., City Line, Bridgeport, Conn.
Burpee Can Sealer Co., 128 West Liberty St., Barrington, Ill.
Continental Can Co., Athens, Ga.
National Pressure Cooker Co., Eau Claire, Wis.
Wisconsin Aluminum Foundry Co., Inc., Manitowoc, Wis.

Food choppers and grinders; food presses
Enterprise Manufacturing Co., Philadelphia, Pa.
Hobart Manufacturing Company, Troy, Ohio

Tin cans
American Can Co., New York Central Bldg., New York, N. Y.
Atlas Can Corp., 241 Wythe Ave., Brooklyn, N. Y.
Continental Can Co., Inc., 100 East 42d St., New York, N. Y.
Eagle Can Co., 356 Mystic Ave., Somerville, Mass.
Independent Can Co., Howard and Ostend Sts., Baltimore, Md.
Heekin Can Co., 6th and Culvert Streets, Cincinnati, Ohio
Pacific Can Co., 290 Division St., San Francisco, Calif.
Phillips Can Co., Cambridge, Md.
Western Can Co., 17th and Rhode Island Sts., San Francisco, Calif.

RESTRICTIONS ON PRODUCTION AND DISTRIBUTION OF FOOD PROCESSING EQUIPMENT

War requirements of critical materials make it necessary to set certain limitations on the production of most civilian goods in order to meet all essential needs.

The manufacture and distribution of most food-processing equipment are, therefore, controlled by various War Production Board orders.

Most canning equipment is controlled by WPB Limitation Order L-292. Briefly, this order provides that preference ratings must be obtained before any single item of equipment costing more than $50 can be purchased. Major items of canning equipment for which a preference rating is required, include: No. 3 retorts, stainless steel-pressure cookers, continuous-type exhaust boxes, motor-driven peelers and pulpers, pea hullers, and power-driven meat grinders. There are no restrictions on the purchase of smaller items such as No. 2 retorts, retort stands, blanching baskets, retort crates, 7- and 14-quart pressure cookers, and open-process kettles, when the cost of those items is less than $50.

In the case of can sealers priorities must be obtained for those costing more than $25. This means that all sealers are restricted except the small, light-duty, hand-operated machines.

Steam-jacketed kettles are controlled by WPB Order L-182 and steam boilers by WPB Order M-293. Priorities must be obtained for both of these items.

Since regulations governing the release of this type of equipment are necessarily changed from time to time in accordance with wartime demands, it is impossible to give in this publication detailed instructions regarding the filing of applications for preference ratings. Any of the following offices, however, should be able to assist prospective purchasers in this connection: War Production Board field offices, State Directors of Food Production War Training, and State supervisors of the Office of Distribution.

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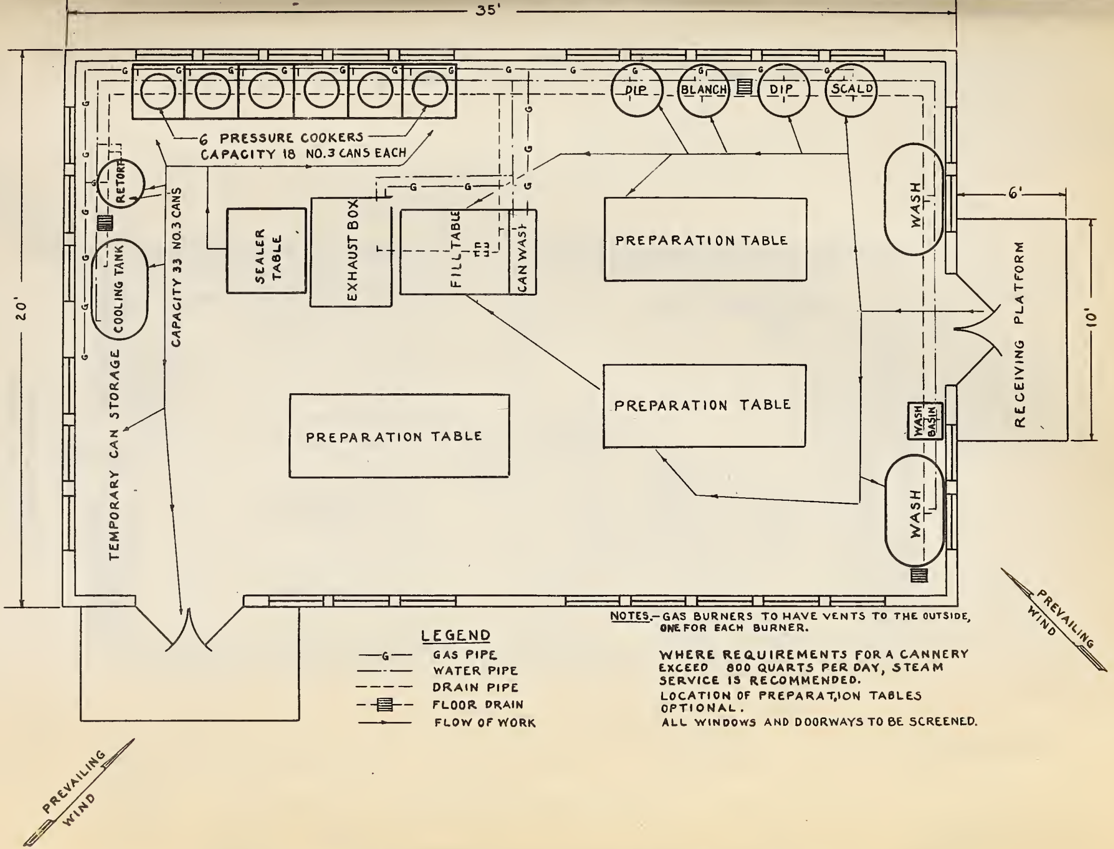

NOTES.—GAS BURNERS TO HAVE VENTS TO THE OUTSIDE, ONE FOR EACH BURNER.

WHERE REQUIREMENTS FOR A CANNERY EXCEED 800 QUARTS PER DAY, STEAM SERVICE IS RECOMMENDED.

LOCATION OF PREPARATION TABLES OPTIONAL.

ALL WINDOWS AND DOORWAYS TO BE SCREENED.

Figure 19.--Plan of community canning plant, using gas service, with daily capacity of 500 to 800 cans.

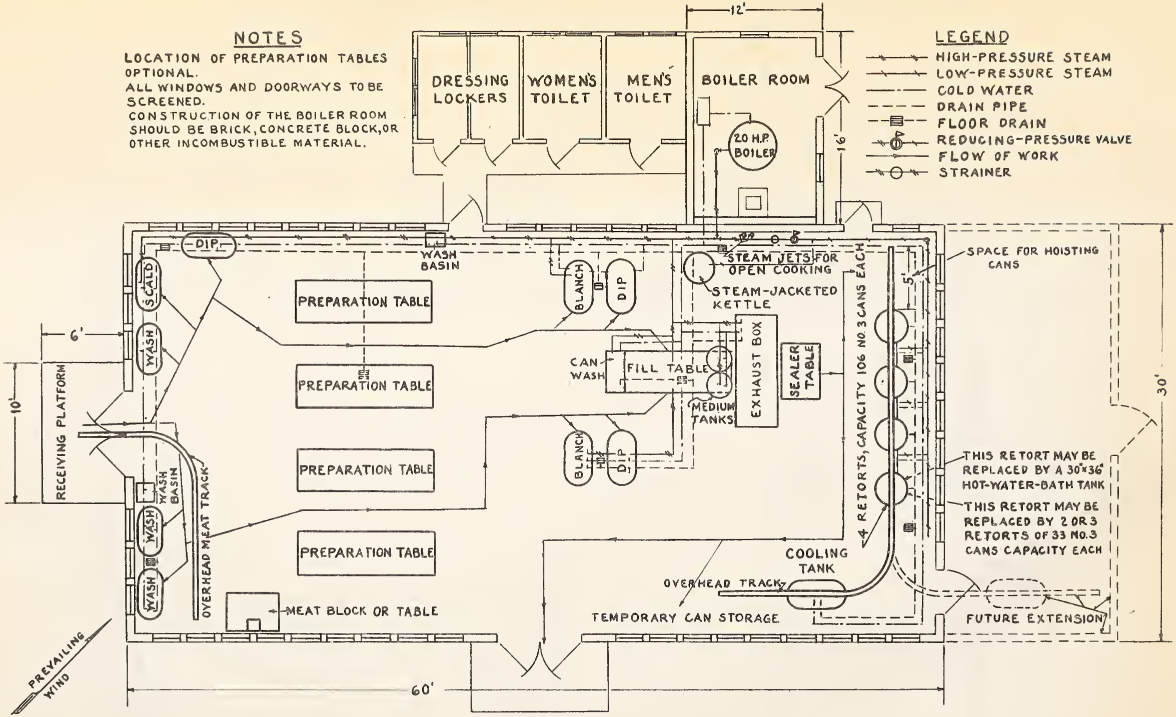

Figure 20.--Plan of community canning plant with daily capacity of 2,000 to 3,000 cans.

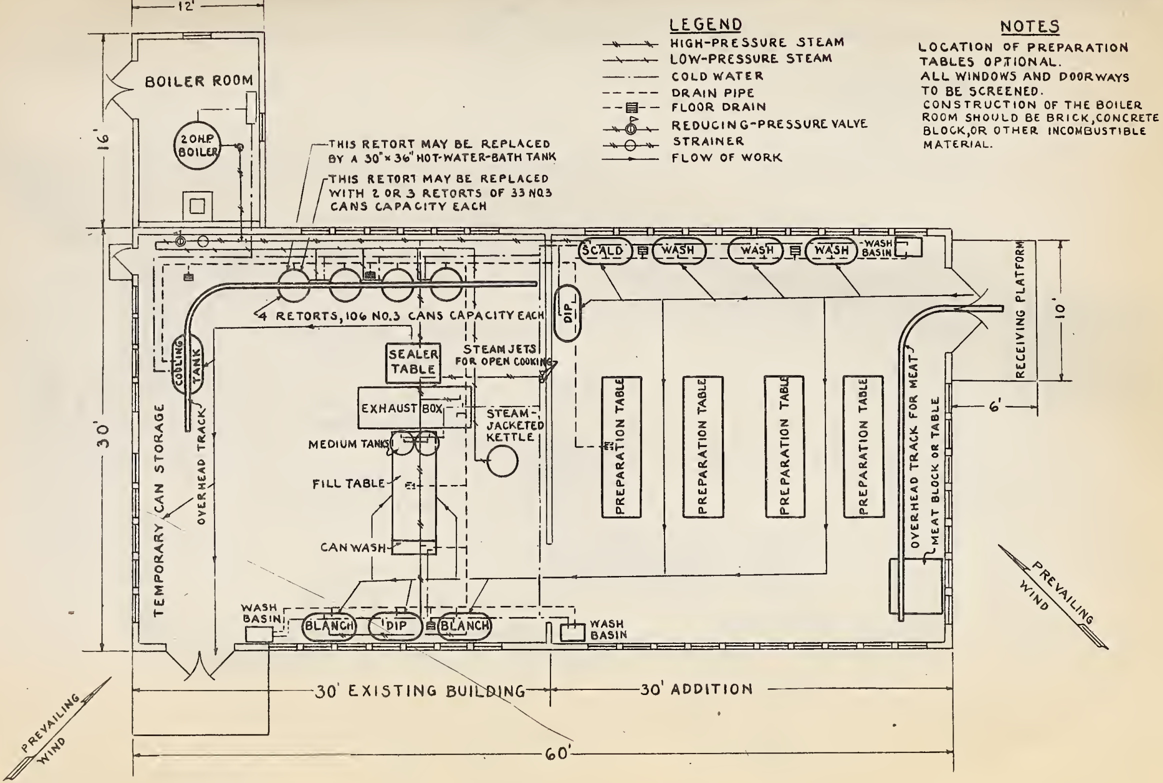

Figure 21.--Plan of community canning plant with addition to existing building to give daily capacity of 2,000 to 3,000 cans.

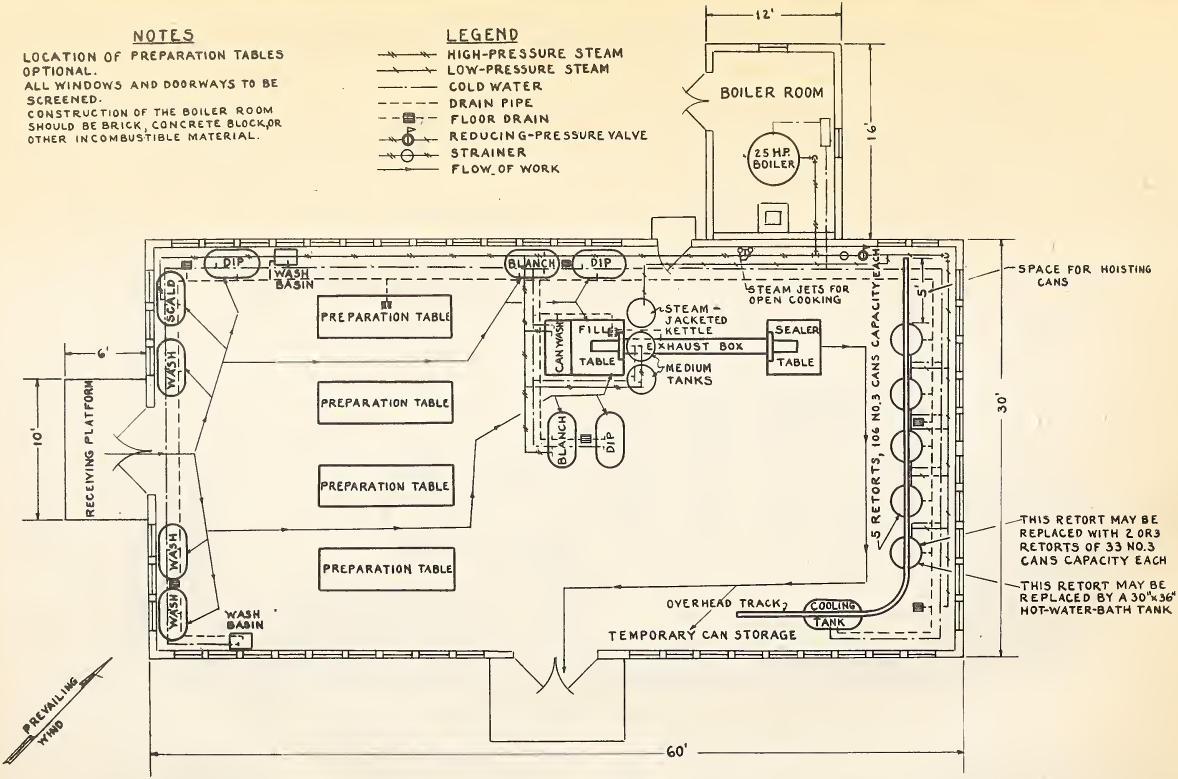

Figure 22.--Plan of community canning plant with daily capacity of 2,500 to 3,500 cans.

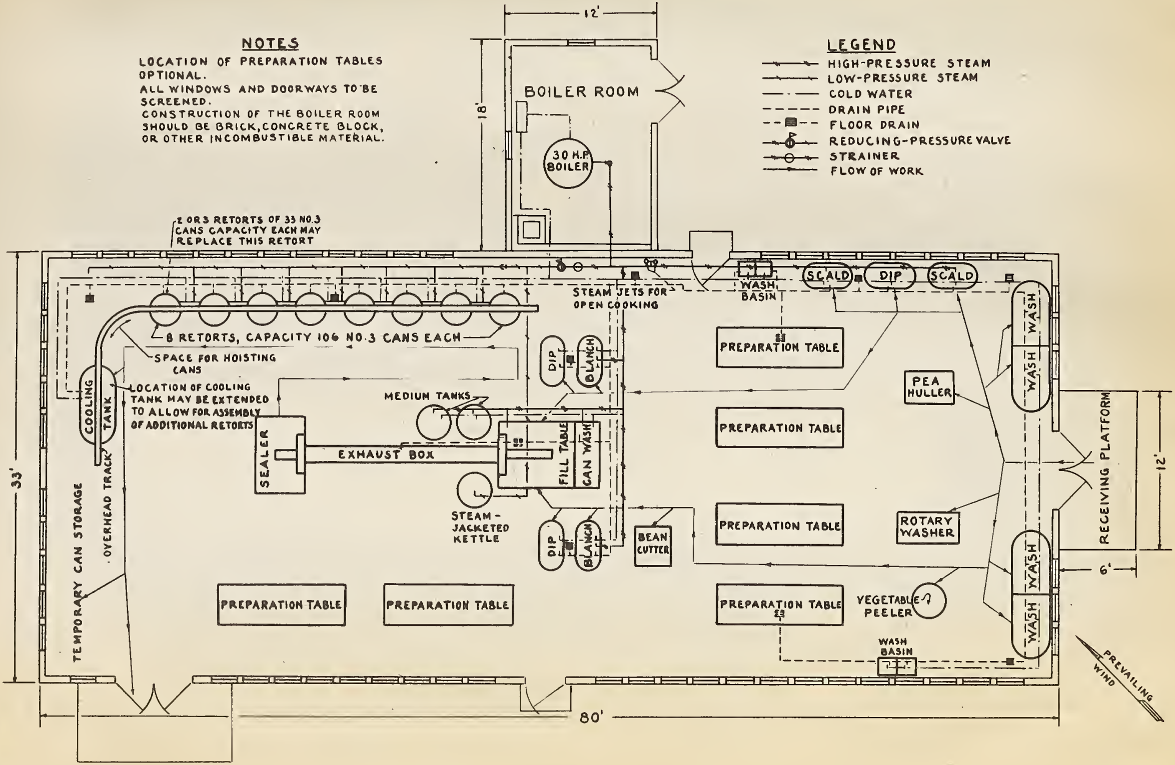

Figure 23.--Plan of community canning plant with daily capacity of 5,000 to 6,000 cans.

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